1.1 Land Use

The three major uses of land in the contiguous 48 States are grassland pasture and range, forest-use land, and cropland, in that order. Total cropland (used for crops, used for pasture, and idled) has trended down slightly since the late 1960's. Greater variation has occurred in cropland used for crops, largely reflecting changes in cropland idled in Federal crop programs. Also, weather, such as the drought in 1988 and the heavy rains in 1993, can strongly influence the mix and acreage of cropland used for crops.

The total land area of the contiguous 48 States is approximately 1.9 billion acres, with an additional 365 million acres in Alaska and a little over 4 million acres in Hawaii (table 1.1.1). Because Alaska has very little crop area and Hawaii grows primarily crops that are not grown elsewhere in the United States, the discussion in this chapter focuses on the contiguous 48 States.

Land is the first factor of production. Land's potential uses and its location determine its economic value. Land use can affect the environment and the sustainability of production. Competition and conflicts occur among users of land because land used in one way often prevents or reduces other uses (see box, "Land Use Choice: Theory and Practice").

Major Land Uses in the Contiguous States

Grassland pasture and range, the largest use of land, accounted for 589 million acres (31 percent of major land uses in the 48 States) in 1992 (latest year data are available, table 1.1.2, fig. 1.1.1). (For definitions of land use terms, see "Glossary of Land Use Categories," p. 24.) However, grassland pasture and range has declined since the mid-1960's, when it was 636 million acres. One reason for this decline has been that farmers—with assistance from the Cooperative State Research, Education and Extension Service, the Natural Resources Conservation Service, and other agencies—have improved the forage quality and productivity of grazing lands. A second reason is

Table 1.1.1—Major uses of land, United States, 1992

Land use[1]	Acreage		Proportion of land	
	48 States	United States	48 States	United States
	Million acres		*Percent*	
Cropland	460	460	24.3	20.3
Grassland pasture and range	589	591	31.1	26.1
Forest-use land	559	648	29.5	28.6
Special uses	194	340	10.2	15.0
Miscellaneous other land	92	224	4.9	9.9
Total land area[2]	1,894	2,263	100.0	100.0

[1] See the Glossary, p. 24, for definitions of land-use categories.
[2] Distributions by major use may not add to totals due to rounding.
Source: USDA, ERS, based on Daugherty, 1995.

Land-Use Choice: Theory and Practice

In theory, land-use choice is straightforward: Land is devoted to the use that provides the greatest value to its owner, as measured by the present value of the stream of returns *expected* in future years. In reality, land-use choice often involves a complex interaction of factors, including the characteristics of the land, the landowner, and the economic and policy contexts in which the choice is made.

Complexity arises in part because land is a highly differentiated economic resource. The location of land—as measured by proximity to the city center, transportation links, or recreational and aesthetic amenities—is a key determinant of its value for residential or commercial development. Productivity, erodibility, and topography largely determine future returns to crop production, pasture, and forestry. Moreover, land may simultaneously pose characteristics that are favorable to and detract from its value for a particular use, creating tradeoffs in land-use decisions. For example, highly productive land may also be highly erodible. Using such land for crops will result in high yields, but may also mean high erosion control costs or, if erosion is unchecked, loss of future productivity. Finally, technological change may ameliorate land-related limitations to specific uses. One example is the development of rolling land for irrigated crop production following the introduction of center-pivot irrigation technology.

Exactly how these factors are assessed depends on the inclinations, circumstances, and economic expectations of individual landowners. For example, landowners who are optimistic about future returns to crop production will use more land for crops than those who are pessimistic. Other factors that affect land-use choices include management skills; discount of future income (where initial land conversion costs are high or for land uses where returns are delayed, e.g. forestry); risk aversion; and the age, occupation, or residence of the landowners.

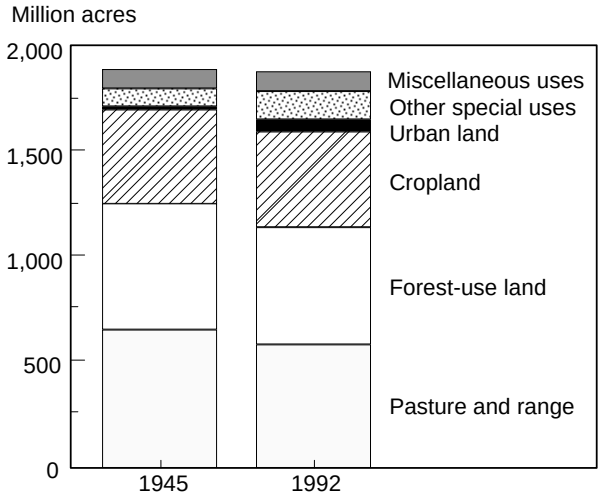
Landowner expectations and actions are affected by government policies and programs. Federal farm commodity programs have long been suspected of encouraging crop production on marginally productive or environmentally sensitive land. Under the Sodbuster and Swampbuster provisions of the 1985 Farm Bill, payments are now withheld from farmers who crop highly erodible land without an approved conservation plan or who drain wetlands. Zoning rules and land taxation may be important in urban fringe areas where rural land is being rapidly developed for residential or commercial purposes. For example, a jurisdiction seeking to retain open space may zone land for agricultural purposes or provide "use value" taxation to landowners who use land for agriculture.

that the number of domestic animals, particularly sheep and draft animals, has been declining in recent years.

Forest-use land, the second largest area among major uses, declined from about 32 percent of total land in 1945 to less than 30 percent in 1992. All land with a forest cover comprises an even larger area—nearly 606 million acres (32 percent) in 1992. However, much forested land is in special uses (parks, wilderness areas, and wildlife areas) that prohibits forestry uses such as timber production. These areas increased from 22 million acres in 1945 to 89 million acres in 1992. As a result, land defined as forest-use declined consistently from the 1960's to 1987, while special uses increased rapidly (table 1.1.2). There was a slight increase in forest-use land from 1987 to 1992, primarily in commercial timberland.

Cropland comprises the third largest use of land (24 percent in 1992) (table 1.1.1). Total cropland in the contiguous States varied about 8 percent between 1945 and 1992—ranging from 478 million acres in

Figure 1.1.1--Major uses of land in the contiguous 48 States



Source: USDA, ERS, based on Krupa and Daugherty, 1990; Daugherty, 1995.

Table 1.1.2—Major uses of land in the contiguous 48 States, 1945-92

Land use[1]	1945	1949	1954	1959	1964	1969	1974	1978	1982	1987	1992
						Million acres					
Cropland[2]	450.7	477.8	465.3	457.5	443.8	471.7	464.7	470.5	468.9	463.6	459.7
Cropland used for crops	363.2	382.9	380.5	358.4	334.8	332.8	361.2	368.4	382.6	330.7	337.4
Cropland idled	40.1	25.6	18.7	33.6	51.6	50.7	20.8	26.0	21.3	68.0	55.5
Cropland used for pasture	47.4	69.3	66.1	65.4	57.4	88.2	82.7	76.1	65.0	64.9	66.8
Grassland pasture and range	659.5	631.1	632.4	630.1	636.5	601.0	595.2	584.3	594.3	588.8	589.0
Forest-use land	601.7	605.6	615.4	610.9	611.8	602.8	598.5	583.1	567.2	558.2	558.7
Forestland grazed	345.0	319.5	301.3	243.6	223.8	197.5	178.9	171.3	157.5	154.6	145.0
Forestland not grazed	256.7	286.1	314.1	367.3	388.0	405.3	419.6	411.8	409.7	403.6	413.7
Special uses[2]	100.0	105.3	110.2	124.4	144.5	143.1	148.0	167.2	176.9	191.2	194.4
Urban land	15.0	18.3	18.6	27.1	29.2	30.8	34.6	44.2	49.6	55.9	58.0
Transportation	22.6	22.9	24.5	25.1	25.8	25.7	26.0	26.3	26.4	25.2	24.8
Recreation and wildlife areas	22.6	27.6	27.5	31.9	49.7	53.4	56.9	66.0	71.1	84.1	86.9
National defense areas	24.8	21.5	27.4	28.9	29.3	22.9	22.4	22.3	21.8	18.9	18.6
Misc. farmland uses	15.1	15.1	12.2	11.3	10.5	10.3	8.0	8.4	8.0	7.1	6.2
Miscellaneous other land	93.4	84.0	80.5	78.9	63.0	78.4	90.6	91.9	88.5	93.9	92.4
Total land, 48 States[2,3]	1,905.4	1,903.8	1,903.8	1,901.8	1,899.6	1,897.0	1,897.0	1,897.0	1,895.7	1,895.7	1,894.1

[1] See the Glossary, p. 24, for definitions of land-use categories.
[2] Distribution may not add to totals due to rounding.
[3] Totals differ over time due to remeasurement of the U.S. land area
Source: USDA, ERS, based on Krupa and Daugherty, 1990; Daugherty, 1995.

1949 to 444 million acres in 1964 (table 1.1.2). The 1992 cropland base of 460 million acres was the lowest since 1964.

The cropland base includes cropland used for crops, cropland idled, and cropland used only for pasture. These components vary more than total cropland. The amount of cropland used for crops has ranged from 383 million acres in 1949 to 331 million acres in 1987 (table 1.1.2). There has been no trend, but instead seemingly two major cycles, with cropland moving from idle into crop use and back again.

Between 1945 and the 1949 peak, cropland used for crops expanded rapidly to meet increased foreign demand for U.S. grain. After the postwar agricultural recovery in these foreign nations, cropland used for crops gradually declined until the early 1970's, when a second round of strong foreign demand occurred for U.S. grains. In 1982, a severe recession in the United States and in other major markets weakened the demand for U.S. agricultural products and grain surpluses piled up. Annual Federal crop programs and the long-term Conservation Reserve Program (starting in 1986) idled additional cropland, again reducing the acreage used for crops.

Cropland is idled every year for reasons other than government programs, including weather or soil conditions at planting time, low crop prices, or holding for eventual conversion to nonagricultural uses.

Between 1945 and 1992, cropland used for pasture ranged from 47 million acres in 1945 (10 percent of total cropland) to 88 million acres (19 percent) in 1969 (table 1.1.2). Cropland pasture averaged about 14 percent of total cropland.

Special uses include urban; rural transportation; rural parks and wildlife; defense and industrial uses; and farmstead, farm roads and lanes, and other miscellaneous onfarm uses (table 1.1.2). These uses increased from 100 million acres (5 percent of the

Table 1.1.3—Major uses of land in the contiguous 48 States, by region, 1992

Land use[1]	North-east	Lake States	Corn Belt	Northern Plains	Appala-chian	South-east	Delta States	Southern Plains	Mountain	Pacific	United States
					Million acres						
Cropland[2]	14.3	42.5	99.6	106.6	29.1	18.1	23.7	55.1	46.7	23.9	459.7
Cropland used for crops	11.1	34.7	80.7	84.5	16.6	10.4	16.5	31.6	33.0	18.2	337.3
Cropland idled	1.2	5.2	8.8	11.5	3.4	3.4	3.0	8.0	7.9	3.1	55.5
Cropland used for pasture	2.0	2.6	10.1	10.6	9.1	4.2	4.3	15.5	5.7	2.6	66.8
Grassland pasture and range	3.0	5.3	12.3	69.7	6.0	9.8	6.4	118.7	303.5	54.5	589.0
Forest-use land	68.5	48.3	31.3	3.7	71.6	73.4	48.3	21.7	112.7	79.3	558.7
Forestland grazed	1.4	3.1	6.6	1.6	5.2	7.3	15.9	11.6	66.7	25.6	145.0
Forestland not grazed	67.1	45.2	24.7	2.1	66.4	66.1	32.4	10.1	46.0	53.7	413.7
Special uses[2]	20.0	13.0	14.9	7.5	13.2	17.3	6.4	12.8	58.4	30.7	194.2
Urban land	10.5	4.0	7.6	1.1	5.6	8.0	2.7	6.4	4.5	7.4	57.8
Transportation	1.9	2.9	3.6	3.5	2.0	2.2	1.2	2.3	3.2	1.9	24.8
Recreation and wildlife areas	7.0	5.3	2.0	1.8	4.1	5.1	1.9	2.7	37.7	19.3	86.9
National defense areas	.4	.1	.3	.2	.9	1.6	.2	.7	12.6	1.6	18.6
Misc. farmland uses	.3	.7	1.3	.8	.6	.4	.4	.8	.5	.5	6.2
Miscellaneous other land	5.6	12.9	6.5	6.9	3.9	4.8	6.4	3.3	26.6	15.5	92.5
Total land, 48 States[2]	111.4	122.1	164.6	194.3	123.7	123.4	91.2	211.6	547.9	203.9	1,894.1

[1] See the Glossary, p. 24, for definitions of land-use categories.
[2] Distribution may not add to totals due to rounding.
Source: USDA, ERS, based on Daugherty, 1995.

land area of the contiguous United States) in 1945 to 194 million acres (10 percent) in 1992.

In response to expanding U.S. population, land in urban uses—for homes, schools, office buildings, shopping sites, and other commercial and industrial uses—increased 285 percent from 15 million acres in 1945 to an estimated 58 million acres in 1992. While the U.S. population nearly doubled, the amount of land urbanized almost quadrupled. However, urban uses still amount to only 3 percent of total land area (table 1.1.2). (See "Preservation of Agricultural Lands," later in this chapter, for a more detailed discussion of recent urbanization of land in the United States.)

Land in transportation uses (highways and roads, railroads, and airports in rural areas) increased by 4 million acres (17 percent) between 1945 and 1982. Transportation uses declined by 2 million acres from 1982 to 1992 (table 1.1.2) due to the abandonment of railroad facilities and rural roads, and the inclusion of some transportation uses into urban areas.

Land used for recreation and wildlife areas expanded 285 percent from 1945 to 1992 (86.9 million acres) mostly from conversion of Federal lands to meet greater public demand for such areas. Land in defense and industrial uses declined 25 percent from 1945 to 1992 (18.6 million acres), with some conversion to urban use. Miscellaneous farmland uses declined 9 million acres between 1945 and 1992 (6.2 million acres). Behind this decline were fewer farms; a trend toward larger, consolidated farms; and an increasing tendency for farm families to live off the farm.

Miscellaneous other land uses changed very little during 1945-1992. These uses include marshes and open swamps that have very little surface use and comprise only a small portion of the Nation's wetlands, which are distributed over other land uses.

Table 1.1.4—Net change in major uses of land in the contiguous 48 States, by region, 1945-92

Land use[1]	North-east	Lake States	Corn Belt	Northern Plains	Appala-chian	South-east	Delta	Southern Plains	Mountain	Pacific	United States
					Million acres						
Cropland[2]	-10.7	-3.7	+7.4	+11.1	-5.9	-8.9	+1.5	+3.3	+14.3	+.5	+9.0
Cropland used for crops	-9.8	-4.5	+2.7	+0.9	-6.3	-9.7	+0.2	-11.0	+8.8	+3.0	-25.8
Cropland idled	-.6	+3.0	+5.9	+2.8	-.3	-1.0	+.6	+5.2	+1.7	-1.8	+15.4
Cropland used for pasture	-.2	-2.3	-1.3	+7.4	+.8	+1.8	+.7	+9.1	+3.9	-.6	+19.3
Grassland pasture and range	-7.1	-4.8	-14.0	-12.6	-7.7	+1.1	-.9	+13.6	-35.7	-2.3	-70.5
Forest-use land[2]	+6.6	-6.1	+2.3	-.4	+7.9	+.4	-3.1	-24.6	-8.8	-17.3	-43.0
Forestland grazed	-7.6	-12.2	-11.0	-1.7	-34.4	-46.3	-27.2	-30.8	-17.9	-10.8	-200.0
Forestland not grazed	+14.3	+6.1	+13.3	+1.3	+42.4	+46.8	+24.0	+6.2	+9.1	-6.4	+156.9
Special uses[2]	+9.7	+6.0	+4.9	-.1	+6.3	+10.8	+2.7	+6.9	+30.4	+16.7	+94.2
Urban land	+6.5	+2.5	+5.0	+.7	+4.5	+6.8	+2.1	+5.5	+3.9	+5.5	+42.8
Transportation	.0	+.2	+.1	-.5	+.3	+.6	+.4	+.6	+.3	+.3	+2.1
Recreation and wildlife areas	+4.2	+4.7	+1.8	+1.1	+2.9	+4.4	+1.5	+1.8	+29.0	+13.0	+64.3
National defense areas	-.1	-.3	-.5	-.4	-.1	-.2	-.7	-.4	-1.9	-1.6	-6.2
Misc. farmland uses	-.8	-1.0	-1.5	-.9	-1.3	-.8	-.5	-.5	-1.0	-.5	-8.9
Miscellaneous other land	+.5	+7.9	-1.4	+.8	-1.9	-4.5	-2.0	-.6	-1.2	+1.4	-.9
Total change, 48 States[2]	-1.0	-.6	-.9	-1.1	-1.2	-1.1	-1.8	-1.5	-1.1	-1.0	-11.3

[1] See the Glossary, p. 24, for definitions of land-use categories.
[2] Distribution may not add to totals due to rounding. Totals of net change do not add to 0 due to periodic remeasurement of the U.S. land area (see table 1.1.2).
Source: USDA, ERS, based on Krupa and Daugherty, 1990; and Daugherty, 1995.

Regional Changes in Land Use

While land in every use occurs in all 10 regions of the contiguous States, some uses are more concentrated in some regions than others (table 1.1.3). Regions with the largest cropland acreages are the Northern Plains, Corn Belt, and Southern Plains. Grassland pasture and range is concentrated in the Mountain and Southern Plains regions. Acreages in forest-use and special uses are highest in the Mountain region.

Some regional shifts in total cropland and cropland used for crops have occurred since 1945. The largest increases occurred in the Corn Belt, Northern Plains, and Mountain regions with smaller increases in the Delta States, Southern Plains, and Pacific regions.

The Northeast, Appalachian, Southeast, and Lake States regions lost cropland between 1945 and 1992 (table 1.1.4). Eastern regions lost cropland because of climatic and geographic constraints; inability to capture economies of scale (that is, prevalence of small farms); and increased urbanization, which drives up land prices and reduces agricultural profit margins. Western increases resulted in part from federally subsidized irrigation water.

Eight of the 10 regions lost grassland pasture and range between 1945 and 1992. These losses ranged from 2.3 million acres in the Pacific region to 35.7 million acres in the Mountain region (table 1.1.4). The Northeast region lost more than 70 percent of its grassland pasture and range, the Appalachian and Corn Belt regions more than 50 percent. The Northeast and Appalachian regions saw the natural reforestation of grassland on abandoned small farms,

loss of grassland to urbanization, and concentration of the dairy industry. Decreases in the Corn Belt, Northern Plains, and Mountain regions were likely associated with the conversion of some grassland pasture or range to cropland as demand for grain intensified.

In most regions, the changes in forest-use land were relatively small. The Northeast and Appalachian regions gained 7 million and 8 million acres of forest land, mainly from farm fields reverting to forest. The Pacific and Mountain regions lost forest-use land to recreation and wildlife areas. One-quarter of forest-use lands were grazed in 1992, down from over half in 1945. The proportional decline was greatest in the more heavily forested Northeast, Lake States, Appalachian, and Southeast regions. The decline in grazing derives from an increased emphasis on improving and managing farm woodlands. In the 1940's and 1950's, the Cooperative Extension Service encouraged farmers to fence livestock out of farm woodlands and to manage these areas for increased productivity of timber and other wood products. In some areas, such as the Appalachian region, many small farms ceased crop and livestock production and became forested. These reforested areas were generally not grazed.

The reduced grazing of forest-use land also reflects major changes in livestock production, including increased emphasis on improved grassland pastures; greater use of controlled, rotation grazing; and increased concentration and specialization in the dairy and beef cattle industry (as opposed to earlier general farming practices). Byproducts of other industries—such as beet and citrus pulp—now substitute for forage. Also, some of the larger, more concentrated dairy farms have moved to confined animal operations, where the cows are not pastured during their production cycle.

The location of special-use lands shifted considerably during 1945-92. Urban-use lands expanded most rapidly in the warmer Sunbelt States of the South and Southwest. Land in rural transportation uses increased in 8 of the 10 farm production regions, while land in recreation and wildlife areas increased in all regions. In contrast, land in national defense areas and miscellaneous farm uses declined in all regions.

Cropland Use and Programs

Total cropland consists of cropland used for crops, cropland idled, and cropland used for pasture (tables 1.1.2-1.1.4). While total cropland has varied up and down and generally declined since 1969, even greater shifts have occurred between cropland used for crops and cropland idled, mostly because of Federal programs. Cropland used for pasture has shown less variation.

Table 1.1.5—Major uses of cropland, United States, 1986-96[1]

Cropland	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	19962
					Million acres						
Cropland used for crops[3]	357	331	327	341	341	337	337	330	339	332	346
Cropland harvested[4]	316	293	287	306	310	306	305	297	310	302	314
Crop failure	9	6	10	8	6	7	8	11	7	8	10
Cultivated summer fallow	32	32	30	27	25	24	24	22	22	22	22
Cropland idled by all Federal programs[3]	48	76	78	61	62	65	55	60	49	55	34
Annual programs	46	60	53	31	28	30	20	23	13	18	0
Conservation Reserve Program[5]	2	16	25	30	34	35	35	36	36	36	34
Total, specified uses[3,6]	405	407	405	402	403	402	392	389	388	388	380

[1] Includes the 48 contiguous States. Fewer than 200,000 acres were used for crops in Alaska and Hawaii.
[2] Preliminary, subject to revision.
[3] Breakdown may not add to totals due to rounding.
[4] A double-cropped acre is counted as 1 acre.
[5] Numbers are gross before subtracting CRP terminations which, by the end of 1996, totaled approximately 1.5 million acres.
[6] Does not include cropland pasture or idle land not in Federal programs that is normally included in the total cropland base.
Source: USDA, ERS, based on a variety of published and unpublished data from FSA (formerly ASCS), ERS, and NASS.

Table 1.1.6—Selected crops harvested, 1996

Selected crops harvested[1]	Area	Proportion of total
	1,000 acres	*Percent*
Principal crops harvested:		
Corn for grain	73,147	22.4
Sorghum for grain	11,901	3.6
Oats	2,687	.8
Barley	6,787	2.1
Total, feed grains[2]	94,522	29.0
All wheat	62,850	19.3
Rice	2,799	.9
Rye	347	.1
Total, food grains[2]	65,996	20.2
Soybeans for beans	63,409	19.4
Peanuts for nuts	1,392	.4
Sunflower	2,499	.8
Dry edible beans	1,718	.5
Sugarbeets	1,323	.4
Sugarcane	845	.3
Potatoes	1,425	.4
Tobacco	734	.2
Cotton	12,833	3.9
All hay	61,029	18.7
Corn silage	5,395	1.7
Sorghum silage	371	.1
Total, all principal crops[2]	313,491	96.1
Citrus fruits[3]	1,104	.3
Noncitrus fruits[4]	1,934	.6
Tree nuts[5]	671	.2
Principal vegetables and melons for the fresh market[6]	1,821	.6
Principal vegetables for processing[7]	1,476	.5
Other crops[8]	5,577	1.7
Estimated total of crops harvested in 1996, including double-cropping[2]	326,074	100.0

[1] Sum of indicated crops for contiguous 48 States.

[2] Percentage distributions may not add to totals due to rounding.

[3] Bearing acreage of oranges, grapefruit, K-early citrus, lemons, limes, tangelos, tangerines, and temples.

4 Bearing acreage of apples, apricots, berries, cherries, cranberries, dates, figs, grapes, kiwifruit, nectarines, olives, peaches, pears, plums, prunes, and strawberries.

[5] Bearing acreage of almonds, hazelnuts, pistachios, and walnuts.

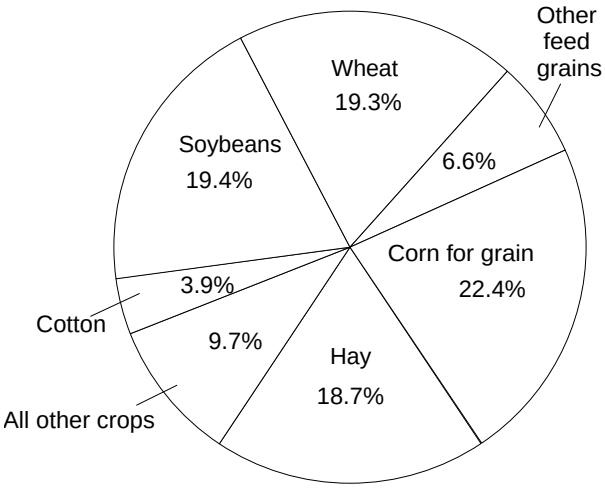
6 Area harvested of artichokes, asparagus, lima beans, snap beans, broccoli, brussels sprouts, cabbage, cantaloups, carrots, cauliflower, celery, sweet corn, cucumbers, eggplant, escarole/endive, garlic, honeydews, lettuce (head, leaf, romaine), onions, bell peppers, spinach, tomatoes, and watermelons. Includes processing total for dual-usage crops (asparagus, broccoli, and cauliflower).

7 Area harvested of lima beans, snap beans, beets, cabbage, carrots, sweet corn, cucumbers, green peas, spinach, and tomatoes.

[8] Determined as a residual.

Source: USDA, ERS, based on NASS, 1996a, 1997a, 1997b, 1997c.

Figure 1.1.2--Harvested crops, 1996



Source: USDA, ERS, based on NASS, 1996b, 1997a, 1997b, 1997c.

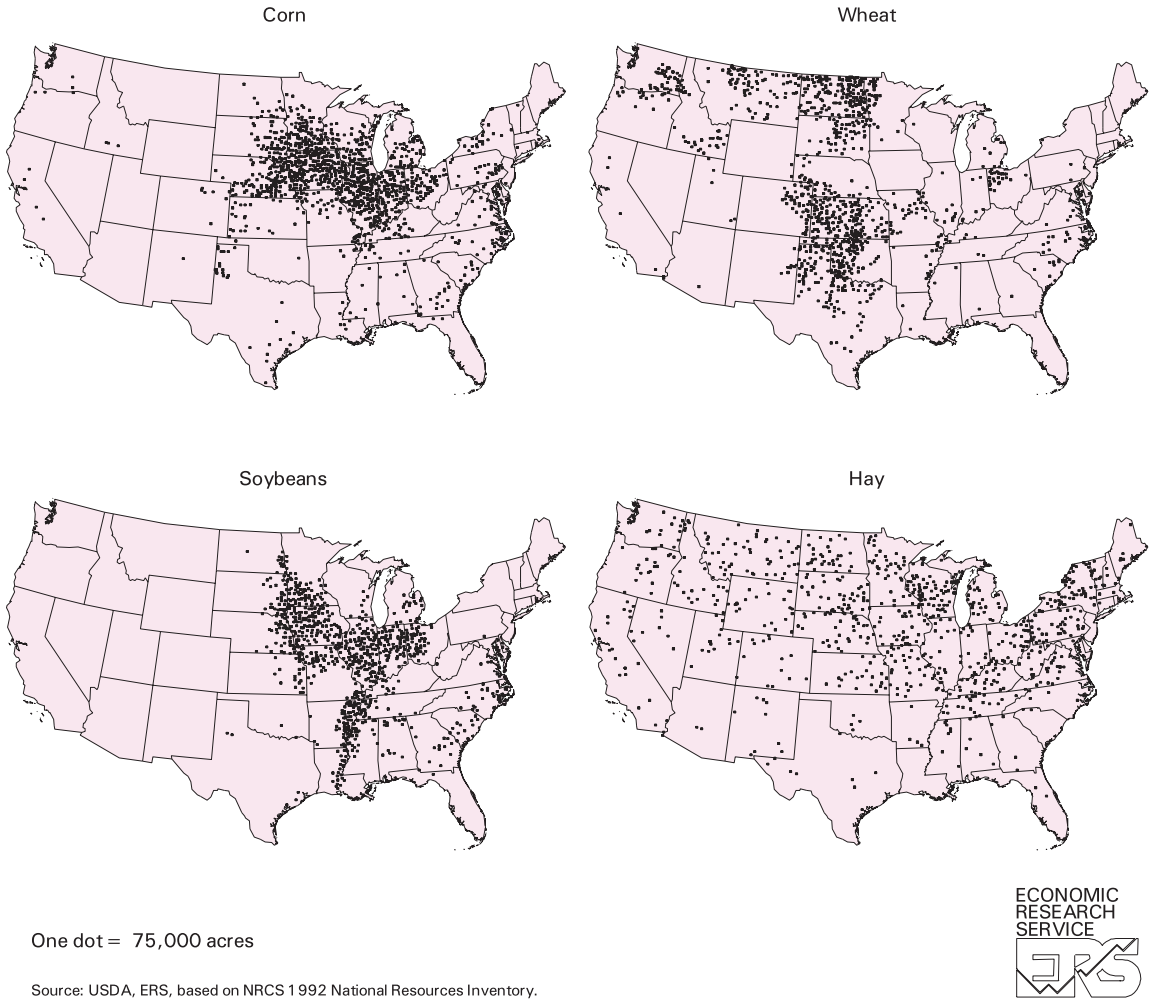
Cropland Used for Crops

Most cropland used for crops is harvested, but typically 2-3 percent experiences crop failure and 7-10 percent is cultivated summer fallow (table 1.1.5). In 1996, farmers harvested an estimated 326 million acres of crops (314 million acres of principal crops). About 12 million acres of the total harvested were double-cropped. When double-cropped land is counted only once, the *cropland harvested* estimate rounds to 314 million acres, up 12 million acres from 1995 as a result of no land idled in annual Federal programs and a larger acreage planted.

The 346 million cropland acres estimated to have been used for crops (cropland harvested, crop failure, and summer fallow) in 1996 were up about 14 million (just over 4 percent) from 1995 (table 1.1.5). This is the largest area used for crops since 1986, the year in which the Conservation Reserve Program (CRP) began. The increase in cropland used for crops reflects higher plantings and less land idled in Federal programs. The decrease of about 21 million acres in cropland idled in Federal programs from 1995 was a result of elimination of annual commodity prgrams and of changes to the CRP.

Four crops—corn for grain, wheat, soybeans, and hay—accounted for nearly 80 percent of all crop acres harvested in 1996 (table 1.1.6 and figs. 1.1.2, 1.1.3). The additional 15 "principal" crops accounted for another 16 percent of harvested area. Vegetables,

Figure 1.1.3 -- Geographic location of corn, wheat, soybean, and hay production, 1992



Source: USDA, ERS, based on NRCS 1992 National Resources Inventory.

fruits, nuts, melons, and all other crops accounted for just 4 percent of crop area harvested in 1996.

In 1996, harvested acreage of corn, sorghum, barley, wheat, and soybeans increased, while the acreage of oats, rice, and cotton decreased (table 1.1.7). Total cropland harvested was up nearly 12 million acres from 1995. The increase in harvested acreage was due to the decrease in land idled in Federal programs.

Food crop acres have tended to increase over the past 30 years, while feed and other crops have declined (Daugherty, 1995). Wheat acreage is higher now than in the 1960's, but down from the early 1980's. Soybean and rice production followed a similar pattern. Peanuts have increased throughout the period while rye has decreased. Sunflower production increased until the early 1980's, declined for a few years and has been increasing again in the 1990's. Sugarcane, while still accounting for less than 1 million harvested acres, has increased consistently since the 1960's. Several other principal crops—dry edible beans and peas, potatoes, and sugarbeets—occupy comparatively small acreages and have exhibited no major trends.

Table 1.1.7—Harvested area of major crops, by region, 1990-96

Crop and period	Northeast	Lake States	Corn Belt	Northern Plains	Appala-chian	Southeast	Delta States	Southern Plains	Mountain	Pacific	United States[1]
					Million acres						
Corn:[2]											
1990-94 avg.	2.2	11.1	34.3	13.1	3.1	1.2	0.5	1.8	1.1	0.3	68.7
1995	2.2	11.4	31.3	12.6	2.7	0.9	.6	2.0	1.0	0.3	65.0
1996[3]	2.4	12.2	34.1	15.1	3.1	1.3	1.4	2.0	1.2	0.4	73.1
Sorghum:[2]											
1990-94 avg.	-	-	0.8	4.6	0.1	0.1	0.5	3.4	0.4	[4]	9.8
1995	-	-	0.7	4.2	[4]	[4]	0.3	2.7	0.3	-	8.3
1996[3]	-	-	0.8	5.8	[4]	[4]	0.4	4.3	0.5	-	11.9
Barley:											
1990-94 avg.	0.2	0.8	-	3.0	0.1	[4]	-	[4]	2.4	0.8	7.3
1995	0.2	0.7	-	2.4	0.1	[4]	-	[4]	2.3	0.6	6.3
1996[3]	0.2	0.6	-	2.8	0.1	[4]	-	[4]	2.3	0.8	6.8
Oats:											
1990-94 avg.	0.3	1.2	0.8	1.6	[4]	0.1	[4]	0.2	0.2	0.1	4.6
1995	0.3	0.8	0.5	0.9	[4]	0.1	[4]	0.1	0.2	0.1	3.0
1996[3]	0.2	0.6	0.4	0.9	[4]	[4]	[4]	0.1	0.2	0.1	2.7
Wheat:											
1990-94 avg.	0.6	3.3	4.7	27.6	1.6	0.9	1.5	9.1	9.7	3.9	62.8
1995	0.6	3.0	4.5	27.0	1.7	0.7	1.2	8.0	10.2	4.0	61.0
1996[3]	0.7	3.2	4.4	27.3	1.8	0.7	1.6	7.8	10.9	4.4	62.8
Soybeans:											
1990-94 avg.	1.2	7.2	30.1	7.2	4.0	1.6	6.5	0.5	-	-	58.2
1995	1.2	8.1	32.5	8.2	3.8	1.1	6.2	0.5	-	-	61.6
1996[3]	1.1	8.4	33.2	8.5	4.0	1.3	6.3	0.6	-	-	63.4
Cotton:											
1990-94 avg.	-	-	0.3	[4]	1.0	1.2	3.1	5.2	0.5	1.1	12.4
1995	-	-	0.4	[4]	1.6	2.5	3.6	6.1	0.5	1.3	16.0
1996[3]	-	-	0.4	[4]	1.3	2.3	3.0	4.3	0.4	1.2	12.8
Rice:											
1990-94 avg.	-	-	0.1	-	-	-	2.1	0.3	-	0.4	3.0
1995	-	-	0.1	-	-	-	2.2	0.3	-	0.5	3.1
1996[3]	-	-	0.1	-	-	-	1.9	0.3	-	0.5	2.8

- = None reported.
[1] Includes the 48 contiguous States. Because of rounding, regional acres may not sum to U.S. totals.
[2] Corn and sorghum for grain.
[3] Preliminary, subject to revision.
[4] Less than 50,000 acres.
Source: USDA, ERS, compiled from USDA, NASS, *Crop Production*, Annual Summary and monthly reports.

Among feedgrains, corn increased from the 1960's to the early 1980's, decreased for a few years, and has trended upward again since the late 1980's. Sorghum and barley fluctuated year-to-year until the mid-1980's when they increased to 30-year highs. Both crops have declined since 1986. Oats has trended down over the last 30 years, while acreage of all hay has changed very little.

Harvested acreage of cotton hit a low of less than 8 million acres in 1983 and has trended upward since. Tobacco has indicated little trend in acreage harvested.

The demand for vegetable oils has led to increased production of some special oilseed crops. Special oilseeds currently reported by NASS include canola, rapeseed, safflower, and mustard seed (USDA, NASS, 1997a). In addition, the Federal commodity programs until 1996 promoted the production of industrial and other crops by allowing these crops to be planted on acreage diversion program lands (see box, "Cropland Programs and Definitions"). The crops allowed in

1995 included castor beans, chia, crambe, crotalaria, cuphea, guar, guayule, hesperaloe, kenaf, lesquerella, meadowfoam, milkweed, plantago ovato, and sesame. Deficiency payments were not reduced when these crops were planted on diverted acreage.

Cropland Idled Under Federal Programs

The Federal Agriculture Improvement and Reform Act of 1996 (the 1996 Farm Act) eliminated the authority of USDA to implement an annual Acreage Reduction Program (ARP) and other annual acreage diversions. As a result, no land was idled under annual commodity programs in 1996. This, combined with the expiration of some CRP contracts, reduced total land idled under Federal programs to about 34 million acres in 1996 (table 1.1.5, table 1.1.9) down from 1995 and well below the 1983 peak of 78 million acres (fig. 1.1.4, table 1.1.14). The extent of idled acres from participation in the CRP varied by farm production region (fig. 1.1.5). In 1995, land idled in annual programs totaled 18 million acres, compared with a range of 13 to 60 million acres idled since 1986.

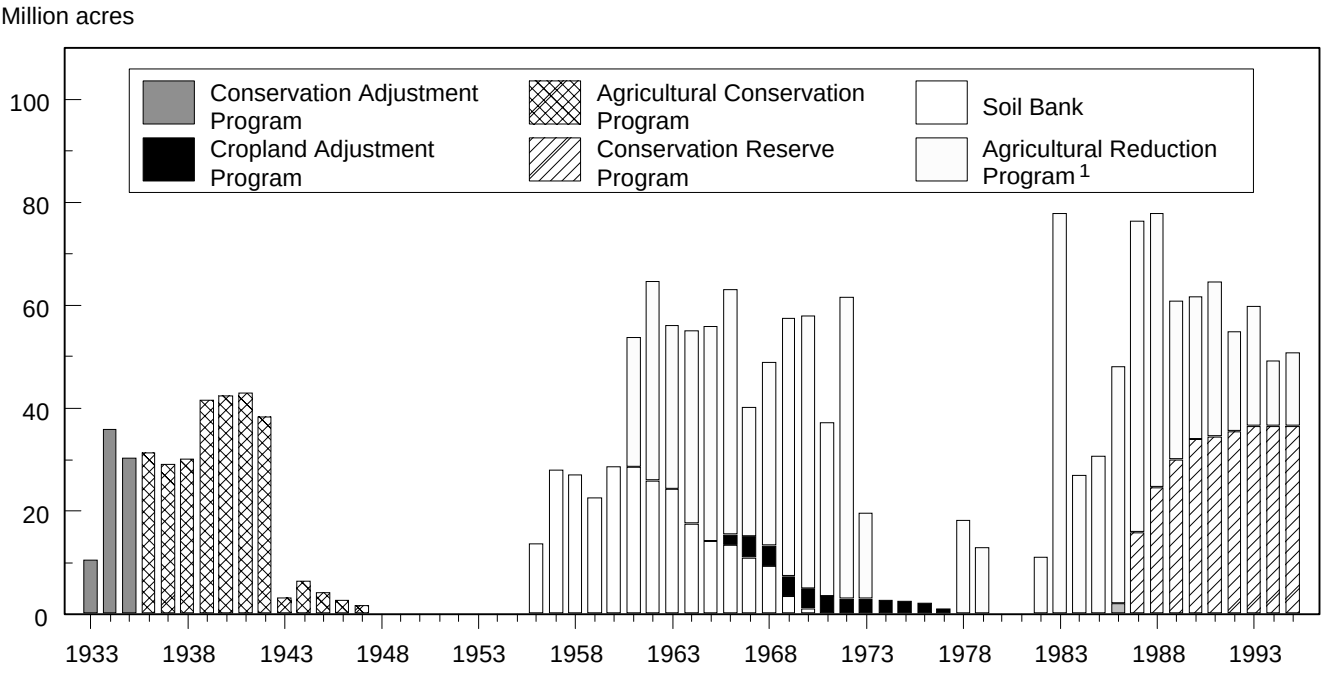
The CRP was initiated in 1986 to help owners and operators of highly erodible cropland conserve and improve the soil and water resources on their farms and ranches through long-term land retirement. CRP pays farmers to retire highly erodible and other environmentally sensitive lands from crop production for 10-15 years and to convert them to perennial vegetation. Since its authorization, 37 million acres of cropland have been enrolled in the CRP. With some producers opting lands out of the CRP in 1995-96 and some terminating prior to early-out, the program in December 1996 stood at just under 33 million acres (for more detail on the CRP, see chapter 6.3).

Prior to 1996, producers of corn, rice, sorghum, oats, barley, wheat, and cotton under USDA commodity programs had to idle a proportion of the crop acreage base and place it in the Acreage Reduction Program (ARP) (see box "Cropland Programs and Definitions," p. 12). These proportions (ARP requirements) varied by crop and year from 0 to 35 percent (table 1.1.8).

Agricultural Land Use Issues

Agricultural uses of land are being affected, and in some cases challenged, by factors other than changing demand for agricultural products and changing agricultural programs. Some continuing or emerging

Figure 1.1.4--Cropland acreage reductions by type of program, 1933-95



For yearly detail of programs since 1974, see table 1.1.14.

[1] Includes Acreage Conservation Reserve, 0,50/85-92 Programs, Paid Land Diversion, and Payment-in-Kind programs in applicable years (see table 1.1.14).

Source: USDA, ERS, based on various published and unpublished data from FSA (formerly ASCS).

Table 1.1.8—Acreage Reduction Program (ARP) requirements for participation in major program crops, 1985-96

Program crop	Proportion of crop acreage base to be idled from program crop and placed in a conserving use											
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
	Percent											
Feed grains:												
Corn	10	17.5	20	20	10	10	7.5	5	10	0	7.5	*
Sorghum	10	17.5	20	20	10	10	7.5	5	5	0	0	*
Oats	10	17.5	20	5	5	5	0	0	0	0	0	*
Barley	10	17.5	20	20	10	10	7.5	5	0	0	0	*
Wheat	20	22.5	27.5	27.5	10	5	15	5	0	0	0	*
Upland cotton	20	25	25	12.5	25	12.5	5	10	7.5	11	0	*
Rice	20	35	35	25	25	20	5	0	5	0	5	*

*Authority for ARP eliminated by the 1996 Farm Act.
Source: USDA, ERS, based on unpublished material from the FSA (formerly ASCS).

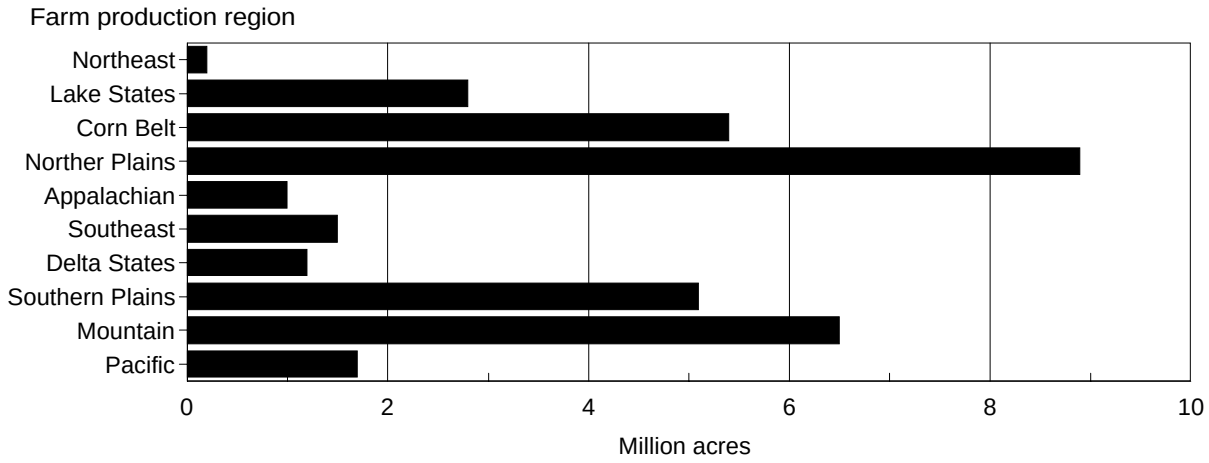
issues include farmland preservation from urbanization, conflicts with other uses of Federal lands, conflicts with environmental preservation, the use of agricultural lands for fuel and biomass production, and potential impacts of global climate change.

Preservation of Agricultural Lands

Preservation of agricultural lands for future food and fiber production and for open space is a concern because conversion, particularly to urban and other special uses, is largely irreversible. Urban and builtup land in the United States constitutes less than 3.5 percent of total land area. However, 75 percent of the U.S. population lives in urban areas (table 1.1.10). Even with large increases in urban area, percentage decreases in rural area are small because rural area is much larger than urban area. The rate of expansion in urban area has decreased from 39 percent during the 1950's to 18 percent during the 1980's (The Natural Resources Inventory (USDA, SCS, 1994) shows a 26-percent increase from 1982-92.)

Land converted to urban uses comes from several different major land uses. From 1982 to 1992, 46 percent of new urban development came from cropland and pasture (fig. 1.1.6). The average annual expansion in urban area was about 1.3 million acres

Figure 1.1.5--Cropland idled under the Conservation Reserve Program, by region, 1996



Source: USDA, ERS, based on various published and unpublished data from FSA (formerly ASCS).

Cropland Programs and Definitions

Conservation Reserve Program (CRP) was designed to voluntarily retire from crop production about 40 million acres of highly erodible or environmentally sensitive cropland for 10-15 years. In exchange, participating producers receive annual rental payments up to $50,000 and 50 percent cost-share assistance for establishing vegetative cover on the land. The Federal Agriculture Improvement and Reform Act (1996 Farm Act) of 1996 limited CRP enrollment to 36.4 million acres.

Acreage Reduction Program (ARP) was a voluntary land retirement program in which farmers reduced their planted acreage of a program crop by a specified proportion of that crop's acreage base to become eligible for deficiency payments, loan programs, and other USDA commodity program benefits. Crops under this program included corn, sorghum, oats, barley, wheat, cotton, and rice. The 1996 Farm Act eliminated the authority of USDA to implement an annual ARP.

0/85-92 Provision, an optional, Federal acreage diversion program, allowed wheat and feedgrain producers to devote all or a portion of their permitted acreage to conservation uses or to a minor oilseed crop, sesame, or crambe and, under some conditions, receive deficiency payments. At least 8 but no more than 15 percent of the producer's maximum payment acres had to be maintained in conserving uses or other allowable crop use. Eliminated by the 1996 Farm Act.

50/85-92 Provision, an optional, Federal acreage diversion program, allowed upland cotton and rice producers to underplant their permitted acreage and, under some conditions, receive deficiency payments on part of the underplanted acreage. At least 50 percent of the crop's maximum payment acreage had to be planted. An additional 8 percent but no more than 15 percent had to be designated for conserving use. Minor oilseeds could not be planted on the 50/92 conservation-use acres but sesame or crambe could be planted, with producers still qualifying for deficiency payments. Eliminated by the 1996 Farm Act.

Crop acreage base, for 1995 wheat and feedgrains, was the average of the acreage planted and considered planted to each program crop in the 5-year-period, 1990-94. For upland cotton and rice, the crop acreage base in 1995 was the average acreage planted and considered planted for 1992-94, with no adjustment for years with zero planted or considered planted acreage. The 1996 Farm Act used crop acreage base only in determining eligible production flexibility contract acreage.

Deficiency payments were payments made to farmers who participated in feedgrain (corn, sorghum, oats, or barley), wheat, rice, or upland cotton programs up to 1996. The payment rate per unit crop production was based on the difference between a target price and the market price or loan rate, whichever difference was less. The total payment a farm received was the payment rate multiplied by the eligible production. Eliminated by the 1996 Farm Act and replaced by production flexibility contract payments in 1996.

Production flexibility contract payments are authorized under provisions of the 1996 Farm Act as a replacement for deficiency payments, and cover the 1996 through 2002 crops of wheat, feed grains, upland cotton, and rice of landowners or producers with eligible cropland. In exchange for a series of annual contract payments for the 7-year period based on a predetermined total dollar amount for each year, the owner or producer agrees to comply with specified conservation requirements concerning the use of highly erodible cropland and wetlands; to comply with planting flexibility requirements of the Act; and to use contract acreage for agricultural or related activities, not for nonagricultural commercial or industrial use.

Production flexibility contract acreage is equal to a farm's crop acreage base for 1996 calculated under the provisions of the previous farm program, plus any returning CRP base acreage and less any new CRP acreage enrollment. A landowner or producer can enroll less than the maximum eligible acreage. In 1996, contracted acreage totaled just over 207.5 million acres, 98.8 percent of the eligible 210.2 million acres (USDA, FSA, 1996).

Table 1.1.9—Cropland idled under Federal acreage reduction programs, 1986-96

Program and crop	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
						Million acres					
Annual programs, base acres:											
Corn	14.2	23.2	20.5	10.8	10.7	7.4	5.2	10.7	2.0	7.5	0
Sorghum	2.9	4.1	3.9	3.3	3.3	2.4	2.0	2.2	1.6	1.6	0
Barley	2.0	3.0	2.8	2.3	2.9	2.1	2.3	2.2	2.1	2.4	0
Oats	0.5	0.8	0.3	0.3	0.2	0.5	0.6	0.8	0.5	0.7	0
Wheat	21.0	23.9	22.5	9.6	7.5	15.6	7.3	5.4	4.6	5.5	0
Cotton	4.0	3.9	2.2	3.5	2.0	1.2	1.7	1.4	1.7	0.2	0
Rice	1.5	1.6	1.1	1.2	1.0	0.9	0.4	0.7	0.3	0.5	0
Total, annual programs[1]	46.1	60.5	53.3	30.9	27.7	30.1	19.5	23.4	12.8	18.4	0
CRP base acres:[2]											
Corn	0.2	2.3	2.8	3.4	3.8	3.9	4.1	4.3	4.3	4.3	4.0
Sorghum	0.2	1.2	1.9	2.2	2.4	2.4	2.4	2.5	2.5	2.5	2.4
Barley	0.1	1.1	1.9	2.4	2.7	2.8	2.8	2.8	2.8	2.8	2.7
Oats	0.1	0.5	0.9	1.1	1.3	1.3	1.4	1.4	1.4	1.4	1.3
Wheat	0.6	4.2	7.1	8.8	10.3	10.4	10.6	10.8	10.8	10.8	10.5
Cotton	0.1	0.7	1.0	1.2	1.3	1.3	1.4	1.4	1.4	1.4	1.4
Rice	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]
Total CRP-idled base acres[1,2]	1.2	10.0	15.5	19.0	21.8	22.0	22.6	23.3	23.3	23.3	22.3
Total base acres idled[1,2]	47.4	70.5	68.8	49.9	49.5	52.1	42.1	46.7	36.1	41.7	22.3
Total CRP-idled nonbase acres[2]	0.7	5.7	8.9	10.9	12.1	12.4	12.8	13.2	13.2	13.2	12.1
Total cropland idled under Federal programs[1,2]	48.1	76.2	77.7	60.8	61.6	64.5	54.9	59.8	49.2	54.8	34.4

[1] Because of rounding, crop acreages may not sum to totals. Base acreages idled under 0/92 and 50/92 programs from 1986 through 1992 are included in annual program data. However, base acres of feed grains and wheat enrolled in 0/92 and planted to oilseeds or other permitted crops in 1991 (0.5 million acres), in 1992 (0.7 million acres), in 1993 (1.0 million acres), in 1994 (1.6 million acres), and in 1995 (1.5 million acres) are not included.

[2] CRP began in 1986. Small acreages of peanut and tobacco base were bid into CRP in addition to the crops listed. Numbers are gross before subtracting CRP terminations which, by the end of 1996, totaled approximately 1.5 million acres.

[3] Less than 50,000 acres.

Source: USDA, ERS, based on various published and unpublished data from FSA (formerly ASCS).

(table 1.1.11). Even so, losing farmland to urban uses does not threaten total cropland or the level of agricultural production, which should be sufficient to meet food and fiber demand into the next century (Vesterby, Heimlich, and Krupa, 1994).

Land use change is dynamic. With the exception of urban land, changes occur to and from major land uses (table 1.1.11). For example, 26.4 million acres (of prime and nonprime land) left cropland and pasture from 1982 to 1992 but 16.3 million acres came into the category, resulting in a net loss of 10.1 million acres. Forestland lost 14.2 million acres, but gained 15.2 million acres for a net gain of 1 million acres.

Prime agricultural land has the growing season, moisture supply, and soil quality needed to produce sustained high yields when treated and managed according to modern farming methods (Heimlich, 1989). About 24 percent of rural non-Federal land is prime. Of land converted to urban, 28 percent is prime, so that urban conversion takes prime land in a slightly greater proportion than its occurrence. Of total cropland and pasture, 48 percent is prime and prime cropland is converted to urban uses at about the same rate as nonprime cropland.

Concerns about preserving agricultural lands and open areas have resulted in the use of a variety of instruments, including property, income, and estate tax incentives; and the use of easements and land

Table 1.1.10—Population and urban area, contiguous 48 States, 1950-90

Year	U.S. population			Urban area[1]	Urban area increase[2]
	Total	Urban	Portion urban		
	--Million--		*Percent*	*Million acres*	*Percent*
1950	151	97	64	18	--
1960	178	124	70	26	39
1970	202	149	74	35	36
1980	225	165	74	47	37
1990	247	185	75	56	18

[1] Data differ somewhat from table 1.1.11 due to different data sources and different time periods.
[2] Percent increase over that of 10 years past.
Source: USDA, ERS, based on USDC, 1991; Frey, 1983.

Table 1.1.11—Land-use changes from 1982 to 1992, contiguous 48 States

Land use[1]	1982 land use totals	In 1992--					
		Cropland and pasture[2]	Range-land	Forest-land	Other[3]	Urban and built-up	Federal land
				Million acres			
1992 land use totals[3,4]	1,891.1	542.3	398.9	395.0	81.6	65.4	408.0
Prime land in 1982:[5]							
Cropland and pasture	267.8	**259.2**	0.7	2.7	1.7	2.9	.6
Rangeland	20.0	1.4	**18.2**	.1	.1	.1	--
Forest land	45.6	1.1	--	**43.3**	.2	.7	.2
Other[2,3]	6.2	.7	--	.2	**5.3**	--	--
Nonprime land in 1982--							
Cropland and pasture	284.3	**266.4**	2.8	8.7	2.4	3.2	.7
Rangeland	388.6	7.4	**373.5**	1.4	1.3	1.8	3.3
Forest land	348.3	3.3	1.1	**336.3**	1.4	4.4	1.8
Other[2,3]	73.0	1.7	.3	1.4	**69.0**	.2	.3
Urban and built-up	51.9	--	--	--	--	**51.9**	--
Federal land	404.7	.7	2.0	.7	.2	--	**401.1**

[1] Numbers in bold indicate the acres that remained in the same use. Nonbold numbers across rows represent land moving out of the 1982 land uses. Nonbold numbers down columns represent land moving into the 1992 land uses.
[2] Includes land in the CRP.
[3] Includes rural transportation, marshland, and barren land.
[4] Distribution by use may not add to totals due to rounding.
[5] Prime land is land that has the growing season, moisture supply, and soil quality needed to sustain high yields when treated and managed according to modern farming methods.
Source: USDA, ERS, based on USDA, SCS, 1994.

trusts (see chapter 1.2, *Land Tenure*, for more discussion).

Conflicts Among Uses of Federal Lands

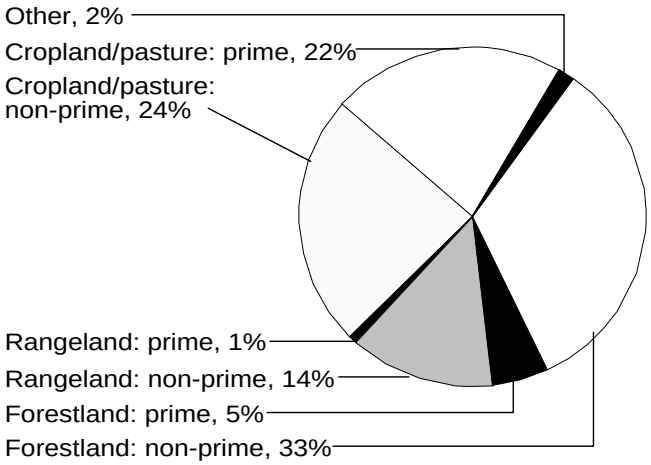
Nearly 29 percent of the Nation's surface area, some 650 million acres, is owned by the Federal Government (U.S. General Services Administration, 1995). Most of this land is administered by USDA's Forest Service (FS) and the Department of the Interior's Bureau of Land Management (BLM), with lesser amounts by the Fish and Wildlife Service (FWS) and National Park Service.

National Forest System (NFS) lands total 191.6 million acres (table 1.1.12 and USDA, FS, 1996). By law, NFS lands are managed to promote multiple uses. Logging and grazing are the principal commercial activities. The NFS includes about 85 million acres of timberland and 96 million acres of rangeland. FY 1995 production from these resources included 3.9 billion board feet of timber (about 13 percent of the national harvest) and almost 9.3 million animal-unit months (AUM's—1 AUM is forage for a 1,000 lb. cow, or the equivalent, for 1 month) of livestock grazing. Other commercial activities include oil, gas, and mineral production. Recreation and conservation are also major uses. The Forest Service manages over 18,000 recreational facilities within the NFS, along with over 125,000 miles of trails and 4,385 miles of wild and scenic rivers. FY 1995 recreational use of NFS lands exceeded 4 billion visitor hours (USDA, FS, 1996). The NFS also includes 35 million acres of designated wilderness. Within the continental United States, NFS lands provide habitat for 113 animal species and 87 plant species listed by the Federal Government as threatened or endangered (BioData, Inc., 1995). The NFS also accounts for about one half of the West's water supply (USDA, FS, 1996).

Bureau of Land Management (BLM) lands total 264 million acres, most of which are in Alaska and 11 Western States (table 1.1.12 and USDI, BLM, 1996). BLM lands are managed for multiple uses, primarily commercial production. The main commercial activity is grazing, with 19,048 grazing permits or leases covering 166.9 million acres in FY 1993 (USDI, BLM, 1996). About 8 million acres of BLM land are classified as timberland. BLM's recreation management efforts target high-use areas that cover about 10 percent of agency lands. These areas contain 4,869 miles of trails and about 2,000 miles of wild and scenic rivers. FY 1995 recreational use of BLM lands was about 880 million visitor hours. As with the Forest Service, BLM has given increasing importance to conservation uses—protecting wetlands and riparian areas, endangered species, and important wildlife habitat. Within the 48 States, BLM lands provide habitat for 61 federally listed threatened or endangered animal species and 77 listed plant species (BioData, Inc., 1995). BLM lands include 5.2 million acres of designated wilderness and 17.4 million acres that are being studied for future designation.

Debate over the use of public lands, particularly those under FS and BLM jurisdiction (that is, those explicitly managed under multiple-use objectives), has become increasingly contentious over the last 20-30 years. Critics argue that FS and BLM give grazing, logging, and mining priority over other land uses (primarily environmental uses but also, to a lesser extent, recreational uses). Federal grazing fees, for example, are generally well below fees charged by private landowners in nearby areas. In 1995, the Federal grazing fee was $1.61 per AUM. For the 11 Western States where BLM and FS lands are concentrated, private land grazing fees (for cattle) averaged $10.30 per AUM (USDA, NASS, 1995a). (See chapter 1.4, *Farm Real Estate Values, Rents, and Taxes*, for more detail on grazing fees and recent proposals to raise fees on public lands.) Similarly, the FS often pays for construction of access roads, which is a major cost component in bringing NFS lands into timber production. With respect to mining, Federal law allows prospectors to take title to public lands, and the minerals they contain, for as little as $2.50 per acre.

Figure 1.1.6--Land urbanized, by prior land use, 1982-92



Source: USDA, ERS, based on USDA, SCS, 1994.

Table 1.1.12—Land-use changes on Bureau of Land Management (BLM) and Forest Service (FS) lands, FY 1983-95

Land use	1983	1985	1987	1989	1991	1993	1995
BLM land (million acres)	341	337	334	270	269	268	264
Grazing - all livestock:							
Number of operators	20,644	19,880	19,532	19,625	19,482	19,048	NR
Acres (1,000)	174,441	165,459	164,458	158,790	166,844	166,922	NR
AUM's authorized (1,000)	10,336	11,218	11,178	11,043	9,602	9,758	9,941
Timber sales:							
Number of sales	1,016	2,277	22,144	23,433	18,925	20,200	NR
Volume (MBF)[1]	240,099	1,042,917	1,264,981	795,729	602,006	87,402	NR
Recreation:							
Number of developed sites	406	375	368	554	726	908	NR
Visitor days (1,000)	27,834	20,384	41,388	41,101	44,982	35,735	73,359
Trails (miles)	2,000	1,600	1,600	1,600	2,300	4,869	NR
High-use areas:							
Number of areas	150	150	150	150	355	521	NR
Percent of BLM lands	5	5	5	5	10	10	NR
Wildlife and Nature:							
Wildnerness areas (number)	6	23	23	25	66	67	136
Wilderness acres (1,000)	19	369	369	469	1,611	1,654	5,227
Wild/scenic Rivers (number)	12	15	15	15	32	32	33
FS land (million acres)	191	191	191	191	191	191	192
Grazing - all livestock:							
Number of paid permittees	14,211	15,029	13,996	11,983	10,491	9,113	8,962
AUMs authorized (1,000)	10,074	10,124	9,953	9,566	9,554	9,195	9,290
Timber:							
Number of sales	235,585	366,874	289,043	275,895	271,963	255,825	216,272
Volume sold (MMBF)[2]	11,061	10,819	11,318	8,415	6,395	4,515	2,885
Volume harvested (MMBF)[2]	9,244	10,941	12,712	11,951	8,475	5,917	3,866
Recreation:							
Visitor days (1,000)	227,708	225,407	238,458	252,495	278,849	295,473	345,083
Trails (Miles)	101,847	99,468	102,507	108,381	116,585	121,059	125,422
Nature and Wildlife:							
Wilderness areas (number)	163	327	348	354	380	397	398
Wilderness acres (1,000)	25,228	32,102	32,457	32,534	33,586	34,584	34,577
Wild and scenic rivers (miles)	1,722	1,919	2,404	3,338	3,417	4,316	4,385

NR = Not reported.
[1] Thousand board feet.
[2] Million board feet.
Sources: USDA, ERS, based on U.S. Department of the Interior, Bureau of Land Management, Public Land Statistics (various years) and USDA, Forest Service, Report of the Forest Service (various years).

Commercial users of Federal lands defend existing policies on a number of grounds. Ranchers argue that Federal rangelands are, on average, of lower quality than private rangeland. Ranchers also fear that raising Federal grazing fees would reduce ranch land values because the value of access to Federal lands is capitalized into the value of ranches. Loggers argue that roads into previously inaccessible areas of the NFS provide a stream of future recreation and logging benefits and that these benefits justify their construction by the Federal Government. The economies of many rural communities, particularly in the West, are heavily dependent on access to Federal lands; reducing this access, it is argued, would increase unemployment in these areas.

In 1995 and 1996, a number of administration and congressional efforts attempted to effect changes in the management of federally owned lands. Whether designed to encourage economic development or

promote conservation objectives, these efforts generally met with stiff opposition, and no major reforms affecting commercial or conservation activities on Federal lands were signed into law.

While the debate over the use of Federal lands is unlikely to be resolved in the near future, elements of the debate have been reflected in land-use patterns. Both NFS and BLM lands saw a marginal decrease in the amount of grazing allowed during 1983-95 (table 1.1.12). Both agencies also sharply decreased their timber sales, largely due to court injunctions brought to address environmental issues, but also reflecting changes in forest management objectives and policy within BLM and FS. Recreation and conservation uses of BLM and FS lands increased significantly between 1983 and 1995. For the two agencies combined, the number of recreational visitor days rose almost 64 percent while the area of designated wilderness expanded 14.6 million acres. There were also significant increases in the number of trail miles and wild and scenic river miles on both FS and BLM lands.

Conflicts With Environmental Preservation

Virtually all of the Nation's 460 million acres of cropland and much of its 591 million acres of grassland pasture and range were once wetlands, forest, native grassland, or some other natural ecosystem. In converting these lands to agricultural uses, many of their environmental goods and services have been damaged or lost. Additionally, incidental consequences of crop and livestock production, such as soil erosion and farm chemical runoff, can stress connected ecosystems. Conservation has become a recurring issue in agricultural policy for two reasons. First, government policies have often encouraged the conversion of natural areas to agriculture and the use of production practices with negative environmental impacts (for example, chemical-intensive monoculture systems). Second, the private benefits of conservation are often insufficient to induce farmers and ranchers to protect natural resources at levels that are optimal from a social perspective. This section briefly discusses five areas where conflicts between agricultural and environmental uses of land are likely to become important policy issues.

Endangered Species. As of September 30, 1995, 663 plant and animal species inhabiting the contiguous 48 States (during at least some part of their life cycle) were listed by the Federal Government as threatened or endangered. Of these species, 380 are listed, at least in part, due to activities typically associated with agriculture (table 1.1.13). Agricultural development (that is, the conversion of land to agricultural production) and grazing threaten the most species, 272 and 171. Exposure to fertilizers and pesticides is a factor in the listing of 115 species. While farm production accounts for the large majority of such listings, some listings are due to nonfarm uses of these chemicals. Of the species listed due to the use of fertilizers and pesticides, 28 have been linked to fertilizers, 85 to herbicides, and 80 to other pesticides.

Competition between agriculture and endangered species for land has heightened due to the Endangered Species Act (ESA) of 1973. The stated purpose of the ESA is to provide a means for protecting ecosystems upon which threatened and endangered (T&E) species depend and to provide a program for the conservation of such species. Several sections of the ESA have important implications for agriculture.

Section 6 prohibits State laws protecting federally listed T&E species from being less restrictive than the ESA. Hence, States have limited ability to grant exemptions to ESA restrictions regardless of compliance costs. Section 7 requires Federal agencies to ensure that actions they fund, authorize, or carry out are not likely to jeopardize the survival of T&E species. Potentially, this brings commodity program participants, users of federally supplied irrigation water, and holders of Federal grazing permits and leases within reach of the ESA. Additionally, Section 11 allows private agents to sue Federal agencies to force their compliance with ESA provisions. This has caused concern that the ESA may be used to restrict pesticide use because these products can be distributed in the United States only if they have been registered or exempted from registration by the Environmental Protection Agency. Finally, Section 9 makes it illegal to take, possess, transport, or traffic in listed animals except by permit; for plants it is illegal to collect or maliciously damage endangered species on Federal lands. For listed animal species then, the ESA can affect land-use decisions on both public and private lands; for listed plant species, it can affect land-use decisions only on Federal lands.

Wildlife Habitat. Agriculture affects the welfare of wildlife populations beyond endangered species. While a few species have adapted well to farm systems (for example, white-tail deer, Canada geese, raccoons, and coyotes), agriculture has negatively impacted most species. Over the last 30 years, habitat loss due to conversion of land to agriculture has reduced wild species numbers more than any other human activity (McKenzie and Riley, 1995). In prairie regions between 1980 and 1989, for example,

Table 1.1.13—Federally listed threatened and endangered (T&E) species in the contiguous 48 States by source of agricultural threat as of September 30, 1995[1]

Species	All T&E species	Source of agricultural threat						
		Agriculture[2]	Agricultural development[3]	Grazing	Fertilizers	Herbicides	Other pesticides[4]	Fertilizers and pesticides[5]
		Number of species						
All species	663	380	272	171	28	85	80	115
Vertebrates:	240	138	106	57	9	18	34	39
Amphibians	10	6	6	3	1	2	2	2
Birds	42	26	20	16	0	3	8	9
Fish	107	64	47	23	6	9	14	17
Mammals	55	27	23	9	1	3	6	7
Reptiles	26	15	10	6	1	1	4	4
Invertebrates:	129	79	63	18	18	37	40	43
Arachnids	5	0	0	0	0	0	0	0
Clams	57	42	39	1	15	30	31	32
Crustaceans	17	11	9	1	2	4	2	4
Insects	29	18	11	11	0	2	5	5
Snails	21	8	4	5	1	1	2	2
Plants:	294	163	103	96	1	30	6	33
Angiosperms	286	160	102	94	1	30	6	33
Gymnosperms	2	1	1	0	0	0	0	0
Ferns	6	2	0	2	0	0	0	0

[1]Table excludes listed marine species and domestic species found only outside the contiguous United States. Some species threatened by nonfarm uses of pesticides and fertilizers are included.

[2] Column 2 does not represent the sum of columns 3-7 because many species face more than one threat from agriculture.

[3] Conversion of land use to cropland.

[4] With respect to agricultural production, the term "pesticides" generally refers to a wide range of chemical compounds that include herbicides, insecticides, fungicides, nematicides, rodenticides, and fumigants. Herbicides, insecticides, and fungicides account for the large majority of pesticide applications in agriculture.

[5] Column 8 does not represent the sum of columns 5-7 because many species are threatened by more than one type of chemical.

Source: USDA, ERS, based on data supplied by BioData, Inc., 1995.

populations of grassland-nesting birds declined 25 to 65 percent. Many duck populations have also fallen dramatically. Mallard, winged teal, and pintail populations, for example, have declined 43, 45, and 71 percent since the 1970's.

At the same time, agriculture must be a key component of any national wildlife conservation program. Within the 48 States, the farm sector owns vast quantities of valuable wildlife habitat, including over 60 percent of all wetlands and 38 percent of all forests and woodlands. Agricultural producers also have senior use rights to millions of acre-feet of surface water in the West. Finally, tens of millions of acres of cropland and pasture have high wildlife producing potential and are thus prime candidates for habitat restoration. Additionally, the success of the Conservation Reserve Program (CRP) in enhancing many wildlife populations is promising (see chapter 6.3, *Conservation Reserve Program*).

Wetlands. In 1780, there were an estimated 221 million acres of wetlands in what is now the contiguous 48 States; a recent estimate is less than 124 million acres (see table 6.5.1 in chapter 6.5, *Wetland Programs*). Bringing land into agricultural production accounts for more than 80 percent of all wetlands lost since colonial times (U.S. Congress, OTA, 1993). Nearly a third of all wetlands losses have occurred in the farm-intensive States of Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin (Dahl, 1990).

In recent years, the full range of ecological functions and economic benefits associated with wetlands has become much better understood; these include critical wildlife habitat, temporary stormwater storage, groundwater recharging, pollution control, sport hunting and fishing opportunities, wildlife viewing, and breeding grounds and nurseries for many commercially important fish, fur, and game species. As a result, Federal wetlands policy has increasingly emphasized conservation, and much of this policy shift has been directed at agriculture. Swampbuster provisions of the Food, Agriculture, Conservation, and Trade Act of 1990, for example, denied crop subsidy payments to farmers who converted wetlands to boost commodity program acreage—even if the converted wetlands were not directly used to produce program crops (U.S. Congress, OTA, 1993). Violation of Swampbuster regulations can mean the loss of eligibility for all farm program benefits—including commodity program participation, crop insurance, and disaster payments—until the violation is remedied. The Wetlands Reserve Program and the Emergency Wetlands Reserve Program pay farmers to preserve their wetlands and offer cost shares to encourage wetlands restoration.

Agriculture's role in converting wetlands to other uses has been declining. Between 1954 and 1974, agriculture accounted for 81 percent of all gross wetlands losses; between 1982 and 1992, it accounted for only 20 percent (see table 6.5.2 in chapter 6.5, *Wetlands Programs*). Furthermore, this percentage change reflects a decrease in conversions of land to agriculture rather than an increase in wetlands losses due to other activities.

About 90 percent of the 124 million acres of wetlands remaining in 1992 in the 48 States was on rural nonfederal lands. Given its ownership of these land resources, the farm sector will likely remain a primary target of wetlands conservation efforts. (See chapter 6.5, *Wetlands Programs*, for more detail.)

Water Quality. Agriculture threatens many wetland and aquatic ecosystems via the discharge of runoff laden with sediments and chemical residues. Nationally, runoff from agricultural land accounts for 60 percent of the sediment and about half of the phosphorus and nitrogen reaching freshwater systems (Crutchfield and others, 1993). This can create a variety of environmental problems in aquatic ecosystems. Nutrients from fertilizer applications can increase algae and plant growth, which in extreme cases can promote eutrophication of streams, lakes, and estuaries. Residues from pesticide applications can have toxic effects on freshwater and marine species as well as their predators. Soil sediments can decrease sunlight penetration in water bodies, deteriorate spawning grounds, and reduce supplies of dissolved oxygen.

Because of the widespread nature of environmental problems associated with agricultural runoff, water quality will continue to be an important source of conflicts between the farm sector and the environment. (For more detail, see chapter 2.2, *Water Quality*, and chapter 6.2, *Water Quality Programs*).

Air Quality. Onfarm air pollution has recently received increased attention. Principal concerns include crop damage, noxious odors, particulate matter or dust, and wildfires. Crop damages occur due to off-farm pollution, such as ozone and other airborne pollutants, drifting into agricultural areas reducing growth and seed formation of field crops. These yield reductions of 5-10 percent are concentrated in areas near large population centers (Westenbarger and Frisvold, 1995). While airborne pollutants do not directly cause a severe reduction in yields, they can weaken plants and make them more susceptible to disease or insect damage.

Onfarm odors have brought about legal action by nearby property owners, who have seen their quality of life and property values suffer. These odors are generally a problem around large-scale livestock facilities, as well as near farms that fertilize with stored manure sludge. Anticipated odor problems have delayed or prevented construction of some livestock or poultry operations. The backlash against noxious odors has prompted some farmers to band together to create "right-to-farm" zones that protect farm operators against lawsuits by newcomers who were aware of the farms' existence before purchasing their property.

Particulate matter, or "fugitive dust," is a problem in dry areas where wind erosion is high. The Agricultural Research Service (ARS) and the Natural Resources Conservation Service (NRCS) are working with the Environmental Protection Agency (EPA) to study conditions that lead to excessive airborne particulate pollution.

Wildfires affect respiratory health in rural areas, and the Forest Service and other agencies manage controlled burning programs to reduce their incidence. In a controlled burn, dry brush and dead trees are removed by burning to remove the kindling that contributes to uncontrolled wildfires.

Using Agricultural Lands for Biomass and Fuel Production

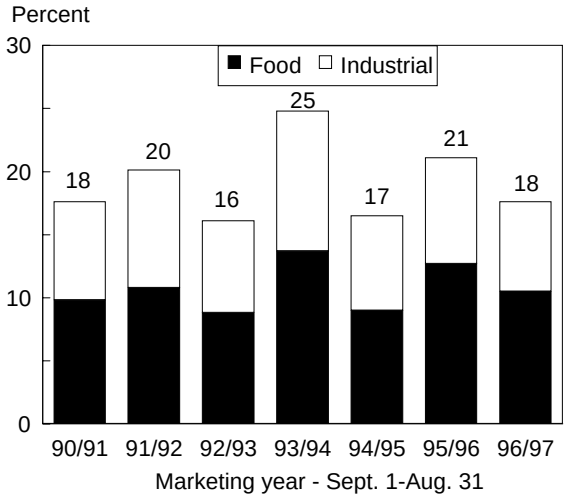
New uses for existing crops have helped to stabilize demand for agricultural commodities. Corn, primarily considered a feedgrain, is increasingly being used in food and industrial products. Food uses—including high-fructose corn syrup, glucose and dextrose, cereals and other products, food starch, and beverage alcohol—will account for a forecasted 975 million bushels of corn in the 1996/97 (September 1-August 31) marketing year (Glaser, 1996). Corn used for industrial uses and fuel alcohol production is forecast to require an additional 661 million bushels (of the 9.3 billion bushels of corn expected to be produced in 1996/97) (USDA, NASS, 1997a).

As the nonfeed demand for corn has increased, a greater share of harvested corn acres has been devoted to food and industrial uses. Based on average yields, food and industrial uses of corn will account for 13 million of the 73 million acres of corn harvested in 1996/97 (USDA, NASS, 1997a). The share of total harvested corn devoted to all food and industrial uses is expected to be the same in 1996/97 as in 1990/91—nearly 18 percent. It has been as high as 25 percent in intervening years (fig. 1.1.7). Much of the increase in nonfeed uses of corn is a result of fuel alcohol production, which increased from about 900 million gallons in 1990/91 to an expected 1.4 billion gallons in 1995/96.

Little of the production from the estimated 23 million corn acres required for the food and industrial uses has come at the expense of other commodities. Since 1990/91, the total amount of acres planted to corn plus the acres set aside under annual programs has declined from 85 million acres to 79 million acres in 1996/97. For the most part, the added food and industrial demand for corn has been met through higher yields and stocks. Since 1990/91, ending corn stocks have averaged about 1.3 billion bushels per year while the food and industrial demand for corn has averaged 1.5 billion bushels per year. However, ending stocks for corn have fallen during the 1990's and added demand could soon have more noticeable impacts on acreage allocation and prices.

Work on new commercial and industrial uses for crops, crop byproducts, and other renewable resources is continuous. Considerable applications are technically possible, but not economical compared with existing alternatives. For example, there is great interest in energy from biomass, which includes liquid and gaseous fuels as well as direct combustion of

Figure 1.1.7--Share of harvested corn acres devoted to nonfeed uses



Source: USDA, ERS, based on Glaser, 1995.

agricultural crops, crop and livestock byproducts, and herbaceous material and wood.

The use of cropland to produce biomass as a primary product will depend on returns to biomass crops exceeding the return to crops currently produced. This may occur through increases in prices, including scarcity of alternative energy sources, the need for the use of biofuels to meet environmental quality standards, or as a result of economic incentives. Cropland idled in the Conservation Reserve Program (CRP) might be used to produce herbaceous or tree crops as biomass energy sources through subsidies that would keep the land out of crop production yet protect and maintain the land resource. However, in early 1996, there was increasing concern with commodity scarcity, not excess stocks, and there was a call for releasing the CRP land for crop production. Thus, estimates of how much land might be used for biomass production require assumptions regarding the demands and supplies of agricultural commodities, types of energy needed, and environmental quality programs (including taxes and incentives). One recent analysis of biomass production in the United States in 2000, 2005, and 2020 concluded that, with the current estimates of the future price and yield relationships, "biomass-based electricity generation is likely to be more of a *niche* than a mass market where electricity is expensive and biomass fuel is cheap or incurs a disposal cost, e.g. waste wood, sawdust, etc." (Roningen and others, 1995). (For more discussion of energy from agricultural biomass, see chapter 3.3, *Energy*.)

Potential Impacts of Global Climate Change

The potential for emissions of greenhouse gases to change Earth's climate has been the subject of concerted Federal research since the late 1970's. The United Nations Framework Convention on Climate Change was signed by representatives from 155 countries, including the United States, at the United Nations Conference on Environment and Development (the Rio Earth Summit) in 1992. Ratification of the Convention by more than 50 nations occurred in late 1994, putting the agreement into force. The United States was among the early nations to ratify the Convention. The key provision for land use is Article 2: "The ultimate objective of this Convention ... is to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."

Recent research conducted at ERS links world land and water resources with climate conditions and economic activity to analyze how four climate change scenarios might affect world agriculture and land use (Darwin and others, 1995). Under the scenarios, reduced productivity on Earth's existing agricultural lands, because of new temperature and precipitation patterns, would be more than offset by expanding agricultural production in new areas. Global food production would increase. However, if climate change were relatively severe, increased food production might not counter losses in other sectors and global economic activity could decrease. Only the effects of changes in atmospheric concentrations of CO_2 on climate were considered. The beneficial effects of greater atmospheric concentrations of CO_2 on plant growth and the effects of changes in the atmospheric concentrations of other gases like ozone and sulphur dioxide on both the climate and plant growth are still under study.

In the United States, all climate change scenarios result in land use changes on at least 48 percent of existing cropland. In two scenarios, more than half of all U.S. cropland ends up with a shorter growing season and 8-19 percent is abandoned (40-90 million acres). Some farm communities would be severely disrupted, particularly in areas where the only economically viable adaptation would be to abandon agriculture. Forest losses in some areas would be offset by gains in others. Likewise, net change in pasture could be negative or positive (from -0.1 to 7.4 percent). The environmental effects of such land use changes have yet to be determined, but will depend on the rate of change in the climate and the speed at which ecosystems migrate.

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Recent ERS Reports on Land-Use Issues

Industrial Uses of Agricultural Materials, Situation and Outlook Report, IUS-6, Aug. 1996 (Lewrene Glaser, Coordinator). Research and market demand open new opportunities for agriculturally based industrial materials. Industrial uses of corn are expected to total 622 million bushels in 1995/96 (Sept./Aug.), down 18 percent from the previous year due to a lower use for ethanol. A special article examines possible biodiesel demand in three niche fuel markets that might be commercialized—Federal fleets, mining, and marine/estuary areas.

Agricultural Adaptation to Climate Change, AER-740, June 1996 (David Schimmelpfennig, Jan Lewandrowski, John Reilly, Marinos Tsigas, and Ian Parry). This report, which highlights ERS research on the effects of climate change on agriculture, focuses on economic adaptation and concludes there is considerably more sectoral flexibility and adaptability than found in other analyses. The report frames the discussion of economic adjustments within the context of global agricultural environmental sustainability.

Major Land Uses, Data Product Stock #890003, Feb. 1996 (Kenneth Krupa and Arthur Daugherty). This electronic data product contains 3 ASCII files containing explanatory and reference material and 16 Lotus 1-2-3 (.WK1) spreadsheet files containing State, regional, and national estimates for separate land uses for census of agriculture years 1945 through 1992. This product updates one with the same title and stock number prepared in 1990 covering the 1945-87 period.

Major Uses of Land in the United States, 1992, AER-723, Sept. 1995 (Arthur Daugherty). This report categorizes the Nation's nearly 2.3 billion acres of land area into major uses by State and farm production region, with national totals for 1992. Similar geographic detail provided for a number of subcategories of cropland, grassland pasture and range, forest-use land, and special land uses.

1995 Cropland Use, AREI Update, 1995, No. 12 (Arthur Daugherty). This annual update of cropland use and Federal commodity program participation indicates that cropland use was down, crop failure and program-idled cropland up in 1995 from 1994. Nearly 3.7 million base acres of the 7 major program crops were "flexed" to non-program crops, of which 2.8 million acres were soybeans.

World Agriculture and Climate Change, Economic Adaptations, AER-703, June 1995 (Roy Darwin, Marinos Tsigas, Jan Lewandrowski, and Anton Ranses). Analysis of four popular climate change scenarios suggests that farmer adaptation and international trade will allow world agriculture to respond to global climate change without imperiling world food production. Regionally, agricultural production possibilities expand in arctic and mountainous areas and contract in tropical and some other areas. In the United States, soil moisture losses may reduce agricultural production possibilities in the Southeast and the Corn Belt.

Urbanization of Rural Land in the United States, AER-673, March 1994 (Marlow Vesterby, Ralph Heimlich, and Kenneth Krupa). Land conversion to urban use has remained constant at about a half acre per household in fast-growth counties since 1960. Urbanization of farmland poses no threat to U.S. food and fiber production in the near future.

Agricultural and Water-Quality Conflicts: Economic Dimensions of the Problem, AIB-676, July 1993 (Steve Crutchfield, LeRoy Hansen, and Marc Ribaudo). Off-farm effects of farm production practices impose costs on society, including damage to fish and wildlife resources, costs of avoiding potential health hazards and protecting natural ecosystems, and lost recreational opportunities. Policies that stress economic and technical assistance can encourage adoption of pollution-reducing farm practices.

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Glossary of Land Use Categories

Cropland—Total cropland includes five components: cropland harvested, crop failure, cultivated summer fallow, cropland used only for pasture, and idle cropland. ***Cropland harvested*** includes row crops and closely sown crops; hay and silage crops; tree fruits, small fruits, berries, and tree nuts; vegetables and melons; and miscellaneous other minor crops. Farmers double-cropped nearly 4 percent of this acreage. ***Crop failure*** consists mainly of the acreage on which crops failed because of weather, insects, and diseases, but includes some land not harvested due to lack of labor, low market prices, or other factors. The acreage planted to cover and soil-improvement crops not intended for harvest is excluded from crop failure and is considered idle. In recent years, crops have failed on 2-3 percent of acreage planted for harvest.

Cultivated summer fallow refers to cropland in subhumid regions of the West cultivated for one or more seasons to control weeds and accumulate moisture before small grains are planted. This practice is optional in some areas, but it is necessary for crop production in the drier cropland areas of the West. Other types of fallow, such as cropland planted to soil-improvement crops but not harvested and cropland left idle all year, are not included in cultivated summer fallow but are included as idle cropland. ***Cropland used only for pasture*** generally is considered to be in long-term crop rotation. However, some land classed as cropland pasture is marginal for crop uses and may remain in pasture indefinitely. This category also includes land that was used for pasture before crops reach maturity and some land used for pasture that could have been cropped without additional improvement. Cropland pasture and permanent grassland pasture have not always been clearly distinguished in agricultural surveys.

Land idled under annual Federal crop programs could have been pastured except during a consecutive 5-month period between April 1 and October 31 designated by the State Agricultural Stabilization and Conservation Committee. If such acreage conservation reserve or conservation use acres were pastured at any time during the year, the Census requested that they be reported as cropland pasture. Land in the CRP could not be pastured. Idle cropland includes land in cover and soil-improvement crops and cropland on which no crops were planted. Some cropland is idle each year for various physical and economic reasons. Acreages diverted from crops to soil-conserving uses (if not eligible for and used as cropland pasture) under Federal farm programs are included in this component.

Cropland used for crops—Three of the cropland acreage components—cropland harvested, crop failure, and cultivated summer fallow—are collectively termed cropland used for crops, or the land input to crop production.

Grassland pasture and range—Grassland pasture and range comprise all open land used primarily for pasture and grazing, including shrub and brushland types of pasture, grazing land with sagebrush and scattered mesquite, and all tame and native grasses, legumes, and other forage used for pasture or grazing. Because of the diversity in vegetative composition, grassland pasture and range are not always clearly distinguishable from other types of pasture and range. At one extreme, permanent grassland may merge with cropland pasture, or grassland may often be found in transitional areas with forested grazing land. This category does not include any land currently in the CRP.

Forest land grazed—Forested pasture and range consist mainly of forest, brushgrown pasture, arid woodlands, and other areas within forested areas that have grass or other forage growth. The total acreage of forested grazing land includes woodland pasture in farms plus rough estimates of forested grazing land not in farms. For many States, the estimates include significant areas grazed only lightly or sporadically.

Forest land—As defined by the Forest Service, forest land is "land at least 10% stocked by trees of any size, including land that formerly had such tree cover and that will be naturally or artificially regenerated. Forest land includes transition zones, such as areas between heavily forested and nonforested lands that are at least 10% stocked with forest trees and forest areas adjacent to urban and built up lands. Also included are pinyon-juniper and chaparral areas in the West and afforested areas" (Powell and others, 1993, p. 117).

Forest-use land—A modified total used in this inventory of 648 million acres of forest land that excludes an estimated 89 million acres in parks, wildlife areas, and similar special-purpose uses. To eliminate all overlap with other uses is not feasible, but this reduced area is a more realistic approximation of the land that may be expected to serve normal forest uses as opposed to having forest cover. Forest-use land includes forested grazing land in this report.

Special-use areas—Special uses in this report include urban areas; highway, road, and railroad rights-of-way and airports; Federal and State parks, wilderness areas, and wildlife refuges; national defense and industrial areas; and miscellaneous farmland uses.

Miscellaneous other land—Includes miscellaneous special uses such as industrial and commercial sites in rural areas, cemeteries, golf courses, mining areas, quarries, marshes, swamps, sand dunes, bare rocks, deserts, tundra, and other unclassified land.

Table 1.1.14—Cropland idled by Federal program and commodity, 1978-95[1]

Item	1978	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
									Million acres									
Acreage Conservation Reserve:																		
Corn	3.2	1.7			2.1	4.4	3.9	5.4	10.4	14.7	14.4	6.3	6.1	4.7	3.1	6.6	0.0	4.7
Sorghum	1.1	0.9			0.7	0.8	0.6	0.9	2.1	2.4	2.2	1.1	1.0	0.8	0.5	0.6	0.0	0.0
Barley	0.6	0.3			0.4	0.5	0.5	0.7	1.6	2.2	1.9	0.8	0.7	0.7	0.4	0.0	0.0	0.0
Oats	0.0	0.0			0.1	0.1	0.1	0.1	0.3	0.5	*	0.1	*	0.0	0.0	0.0	0.0	0.0
Feed grains[2]	4.9	2.9			3.3	5.9	5.1	7.2	4.5	19.8	18.6	8.2	7.9	6.2	4.1	7.2	0.0	4.7
Wheat	8.3	7.4			5.8	8.8	10.4	11.9	15.8	20.2	19.2	6.1	2.2	10.1	3.3	0.0	0.0	0.0
Cotton	0.0	0.0			1.6	2.5	2.5	2.3	3.3	3.2	1.5	3.1	1.5	0.6	1.3	1.0	1.5	0.0
Rice	0.0	0.0			0.4	0.6	0.8	0.7	1.3	1.3	0.9	0.9	0.7	0.2	0.0	0.2	0.0	0.2
Total[2]	13.1	10.3			11.1	17.8	18.7	22.1	34.8	44.5	40.3	18.4	12.3	17.1	8.6	8.4	1.5	4.9
0,50/85-92 Programs:[3]																		
Corn									0.6	1.4	2.9	4.5	4.6	2.7	2.2	4.3	2.4	3.0
Sorghum									0.4	0.5	1.1	2.2	2.3	1.7	1.5	1.7	1.6	1.7
Barley									0.2	0.3	0.6	1.5	2.2	1.5	1.9	2.5	2.7	2.9
Oats									0.1	0.1	0.2	0.3	0.2	0.6	0.7	0.8	0.6	0.8
Feed grains[2]									1.3	2.3	4.8	8.5	9.3	6.5	6.3	9.3	7.2	8.4
Wheat									1.3	3.7	3.2	3.5	5.3	5.8	4.0	5.7	0.2	6.1
Cotton									0.8	0.7	0.6	0.4	0.5	0.6	0.4	0.4	0.2	0.2
Rice									0.2	0.2	0.1	0.2	0.3	0.7	0.4	0.5	0.3	0.3
Total[2]									3.5	7.0	8.8	12.6	15.3	13.6	11.2	15.9	12.9	15.0
Long-term programs:[4]																		
Corn									0.2	2.3	2.8	3.4	3.8	3.9	4.1	4.3	4.3	4.3
Sorghum									0.2	1.2	1.9	2.2	2.4	2.4	2.4	2.5	2.5	2.5
Barley									0.1	1.1	1.9	2.4	2.7	2.8	2.8	2.8	2.8	2.8
Oats									0.1	0.5	0.9	1.1	1.3	1.3	1.4	1.4	1.4	1.4
Feed grains[2]									0.6	5.1	7.4	9.0	10.2	10.3	10.6	11.0	11.0	11.0
Wheat									0.6	4.2	7.1	8.8	10.3	10.4	10.6	10.8	10.8	10.8
Cotton									0.1	0.7	1.0	1.2	1.3	1.3	1.4	1.4	1.41	1.4
Rice									*	*	*	*	*	*	*	*	*	*
Non-base acres									0.7	5.7	8.9	10.9	12.1	12.4	12.8	13.2	13.2	13.2
Total[2]									1.9	15.7	24.4	29.9	33.8	34.4	35.4	36.4	36.4	36.4
Paid Land Diversion:																		
Corn	2,9	1.2				5.9	0.0	0.0	1.8	7.0	3.2							
Sorghum	0.3	0.3				1.3	0.0	0.0	0.4	1.2	0.6							
Barley	0.2	0.0				0.6	0.0	0.0	0.2	0.4	0.3							
Oats	0.0	0.0				0.2	0.0	0.0	0.1	0.2	0.0							
Feed grains[2]	3.4	1.5				8.0	0.0	0.0	2.4	8.8	4.1							
Wheat	0.0	0.0				3.5	5.7	6.9	3.9	0.0	0.0							
Cotton	0.3	0.0				*	0.0	1.3	0.0	0.0	0.0							
Rice	0.0	0.0				0.2	0.0	0.6	0.0	0.0	0.0							
Total[2]	3.7	1.5				11.7	5.7	8.8	6.4	8.8	4.1							
Payment-In-Kind:																		
Corn						21.9	0.0											
Sorghum						3.6	0.0											
Barley						0.0	0.0											
Oats						0.0	0.0											
Feed grains[2]						25.2	0.0											
Wheat						17.7	3.6											
Cotton						4.2	0.0											
Rice						1.1	0.0											
Total[2]						48.6	3.6											

See footnotes at end of table.

Table 1.1.14—Cropland idled by Federal program and commodity, 1978-95, continued[1]

Item	1978	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
									Million acres									
All programs:[2]																		
Corn	6.1	2.9			2.1	32.2	3.9	5.4	12.9	25.5	23.3	14.1	14.5	11.3	9.3	15.2	6.6	12.0
Sorghum	1.4	1.2			0.7	5.7	0.6	0.9	3.1	5.3	5.8	5.4	5.7	4.8	4.5	4.7	4.1	4.2
Barley	0.8	0.3			0.4	1.1	0.5	0.7	2.2	4.1	4.7	4.7	5.6	4.9	5.2	5.3	5.5	5.7
Oats					0.1	0.3	0.1	0.1	0.6	1.3	1.1	1.4	1.5	1.9	2.0	2.2	2.0	2.2
Feed grains[2]	8.3	4.4	0.0	0.0	3.3	39.4	5.1	7.2	18.8	36.1	34.9	25.6	27.3	22.9	21.0	27.5	18.2	24.1
Wheat	8.3	7.4			5.8	30.0	19.6	18.8	21.6	28.1	29.6	18.4	17.8	26.3	17.9	16.5	16.0	16.9
Cotton	0.3				1.6	6.8	2.5	3.6	4.1	4.5	3.2	4.7	3.3	2.6	3.1	2.8	3.1	1.6
Rice					0.4	1.8	0.8	1.3	1.5	1.6	1.1	1.2	1.0	0.9	0.4	0.7	0.3	0.5
Non-base acres					0.0	0.0	0.0	0.0	0.7	5.7	8.9	10.9	12.1	12.4				
Total [2]	16.8	11.8	0.0	0.0	11.1	78.0	28.0	30.9	46.6	76.0	77.7	60.8	61.5	65.1	55.2	60.7	50.8	56.3
Cropland used for crops	369	378	382	387	383	333	373	372	357	331	327	341	341	337	337	330	339	333

* = Less than 50,000 acres

[1] A blank cell indicates program was not in effect that year for that crop.

[2] Distributions may not add to totals due to rounding.

[3] Includes cropland participating in the 0,50/85-92 programs but planted to allowed minor oilseeds or industrial/other crops.

[4] Data represent the Conservation Reserve Program (CRP) from 1986-94. There was no long-term retirement program between 1977 and 1986.

Source: USDA, ERS, compiled from unpublished materials provided by the Farm Service Agency.

1.2 Land Tenure

While most U.S. land was once held by the Federal Government, 60 percent (including virtually all farmland) is now privately owned. Most farms and most farmland are held by individuals or families, but leased land represents an increasing share of their operations as farm numbers decline and average farm size increases. Partial interests in land play a growing role in the conservation efforts of public agencies and private organizations.

Contents

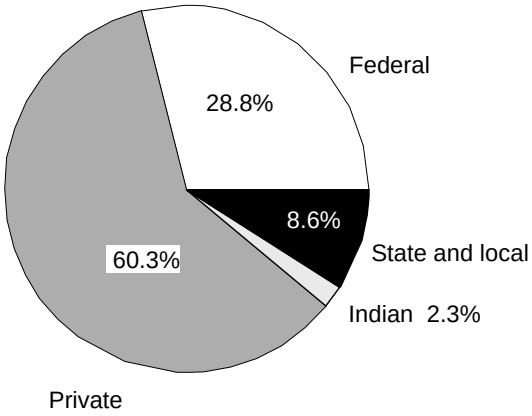
Land tenure is the system of rights and institutions that shapes access to land. Ownership and leasing are common features of land tenure in the United States. Less frequently recognized are zoning ordinances, subsurface mineral rights, conservation easements, and other instruments that arise out of law, custom, and the operation of private markets. Land tenure influences decisions about how land and other resources are used. These decisions, in turn, have important economic and environmental consequences for landowners and for other members of society.

Ownership of U.S. Land

The land surface of the United States covers 2.3 billion acres. Sixty percent (1.4 billion acres) is privately owned, 29 percent is owned by the Federal Government, 9 percent is owned by State and local governments, and 2 percent is on Indian reservations (fig. 1.2.1). Virtually all cropland is privately owned, as is over half of grassland pasture and range and forest land (table 1.2.1; cropland and other terms are defined in the Glossary, p. 38). Federal, State, and local government holdings consist primarily of forest land and other land.

While 60 percent of U.S. land is privately owned today, land tenure patterns were significantly different in the first century after independence. Between 1781 and 1867, through purchase, cession, and treaty, the Federal Government acquired lands totaling 81 percent of current U.S. area—the original "public domain" (table 1.2.2). The largest acquisition, the Louisiana Purchase, added 530 million acres in 1803.

Figure 1.2.1--Land ownership in the United States, 1992



Note: Includes all 50 States for a total of 2.3 billion acres.
Source: USDA, ERS, based on Daugherty, 1995.

Table 1.2.1—Ownership of land by major use, United States, 1992

Ownership	Crop-land	Grass-land pasture & range	Forest land[1]	Other[2]	Total[4]
			Million acres		
Federal	--	146	249	256	651
State & local	3	41	78	73	195
Indian[3]	2	33	13	5	53
Private	455	371	397	141	1,364
Total[4]	460	591	737	475	2,263

-- = less than 500,000 acres.

[1] Includes reserved forest land in parks and other special uses.

[2] Includes urban land, highways, and other miscellaneous uses; excludes an estimated 83 million acres in special uses that have forest cover and, therefore, are included with forest land.

[3] Managed in trust by the Bureau of Indian Affairs, U.S. Department of the Interior.

[4] Totals represent all 50 States.

Source: USDA, ERS, based on Daugherty, 1995.

Other large acquisitions included cessions from the original 13 States and from Mexico, as well as the Alaska Purchase. Acquisitions after 1867, including purchase of degraded forest and farmlands, added most of the Eastern United States' national forests (45 million acres) as well as 4 million acres of national grasslands (National Research Council, 1993; U.S. Department of Agriculture, Forest Service, 1993).

As of 1995, 1.1 billion acres of the original public domain (51 percent of total U.S. area) had been granted or sold by the Federal Government to States, corporations, and individuals (table 1.2.3). Grants to States totaled 329 million acres, including 65 million acres of wetlands granted on condition that proceeds from their subsequent sale to individuals be used to convert those acres to agricultural production. Another 288 million acres were granted or sold directly to homesteaders on condition that the land be settled and cultivated. Disposition of Federal lands had slowed by the 1930's, and in 1976 the Federal Land Policy and Management Act explicitly directed that most remaining Federal lands be retained in Federal ownership (National Research Council, 1993). Remaining Federal lands totaled 650 million acres in 1993 (table 1.2.4).

Most lands in Federal ownership are managed by four agencies: USDA's Forest Service; and the Department of the Interior's Bureau of Land Management (BLM), Fish and Wildlife Service (FWS), and National Park Service (NPS) (table 1.2.5). Federal lands are concentrated in Alaska and the West (fig. 1.2.2, table 1.2.6). Forest Service and BLM lands are managed for a variety of uses, including grazing, timber harvest, and wilderness preservation, while FWS and NPS lands are managed primarily for preservation and recreation. Controversies over public lands, for example with regard to grazing and timber harvests, have prompted proposals to transfer management, if not ownership, of some of these lands to States and

Table 1.2.2—Acquisition of the original public domain, 1781-1867

Acquisition	Year(s)	Land area	Water area	Total area	Percent of total U.S. land	Cost
		Million acres			*Percent*	*$ million*[3]
State cessions	1781-1802	233.4	3.4	236.8	10.5	6.2
Louisiana Purchase[1]	1803	523.4	6.5	529.9	23.4	23.2
Red River Basin	1782-1817	29.1	0.5	29.6	1.3	--
Cession from Spain	1819	43.3	2.8	46.1	2.0	6.7
Oregon Compromise	1846	180.6	2.7	183.4	8.1	--
Mexican Cession	1848	334.5	4.2	338.7	15.0	16.3
Purchase from Texas	1850	78.8	0.1	78.9	3.5	15.5
Gadsden Purchase	1853	19.0	0.0	19.0	0.8	10.0
Alaska Purchase[2]	1867	365.3	12.9	378.2	16.7	7.2
Total	1781-1867	1,807.5	33.2	1,840.7	81.3	85.1

[1] Excludes areas eliminated by the treaty of 1819 with Spain.

[2] Adjusted for the recomputation of the areas of the United States that was made for the 1980 decennial census.

[3] Nominal dollars.

Source: USDA, ERS, based on U.S. Department of the Interior, Bureau of Land Management, 1996.

Table 1.2.3—Disposition of the original public domain, 1781-1995

Disposition	Acres	Percent of total disposition
	Million	*Percent*
Granted to States for:		
Support of common schools	77.6	6.8
Reclamation of swampland	64.9	5.7
Construction of railroads	37.1	3.2
Support of miscellaneous institutions[1]	21.7	1.9
Canals and rivers	6.1	0.5
Construction of wagon roads	3.4	0.3
Other[2]	117.6	10.3
Total granted to States	328.5	28.7
Granted or sold to homesteaders[3]	287.5	25.1
Granted to railroad corporations	94.4	8.2
Granted to veterans as military bounties	61.0	5.3
Confirmed as private land claims[4]	34.0	3.0
Sold under timber and stone law[5]	13.9	1.2
Granted or sold under timber culture law[6]	10.9	1.0
Sold under desert land law[7]	10.7	0.9
Other[8]	303.5	26.5
Total dispositions, 1781-1995	1,144.4	100.0

[1] Universities, hospitals, asylums, etc.

[2] Construction of unspecified public improvements, reclamation of desert lands, etc.

[3] The homestead laws generally provide for the granting of lands to homesteaders who settle upon and improve vacant agricultural public lands.

[4] The Government has confirmed title to lands claimed under valid grants made by foreign governments prior to the acquisition of the public domain by the United States.

[5] The timber and stone laws provided for the sale of lands valuable for timber or stone but unfit for cultivation.

[6] The timber culture laws provided for the granting of public lands to settlers on condition that they plant and cultivate trees on the lands granted.

[7] The desert land laws provide for sale of arid agricultural public lands to settlers who irrigate them and bring them under cultivation.

[8] Chiefly public, private, and pre-emption sales, but includes mineral entries, strip locations, and sales of townsites and townlots.

Source: USDA, ERS, based on U.S. Department of the Interior, Bureau of Land Management, 1996.

Table 1.2.4—Federal land acquisition, disposition, and holdings as of 1993

Item	Million acres
Public domain acquisitions	1,840.7
- Public domain dispositions	1,144.4
- Water area	33.2
- Lands held in trust	52.0
+ Net other Federal acquisitions[1]	39.2
= Federal landholdings, 1993[2]	650.3

[1] This figure reconciles BLM data on public domain acquisitions, dispositions, and waters with GSA data on lands held in trust and Federal landholdings in 1993. GSA reports net Federal acquisitions of 59.9 million acres as of 1993.

[2] This total reflects a 0.8-million acre decline in Federal ownership from the 1992 total reported in table 1.2.1.

Source: USDA, ERS, based on U.S. Department of the Interior, Bureau of Land Management, 1996; U.S. General Services Administration, 1995.

Table 1.2.5—Federal landholdings by agency, 1993

Department/Agency	Million acres	Percent of total
Department of Agriculture	184.9	28.4
Forest Service	184.5	28.4
Other Agencies	0.4	0.1
Department of Defense	20.8	3.2
Department of the Interior	443.4	68.2
Bureau of Land Management	271.2	41.7
Fish and Wildlife Service	90.4	13.9
National Park Service	73.2	11.3
Other Agencies	8.6	1.3
Other Departments	1.2	0.2
Total[1]	650.3	100.0

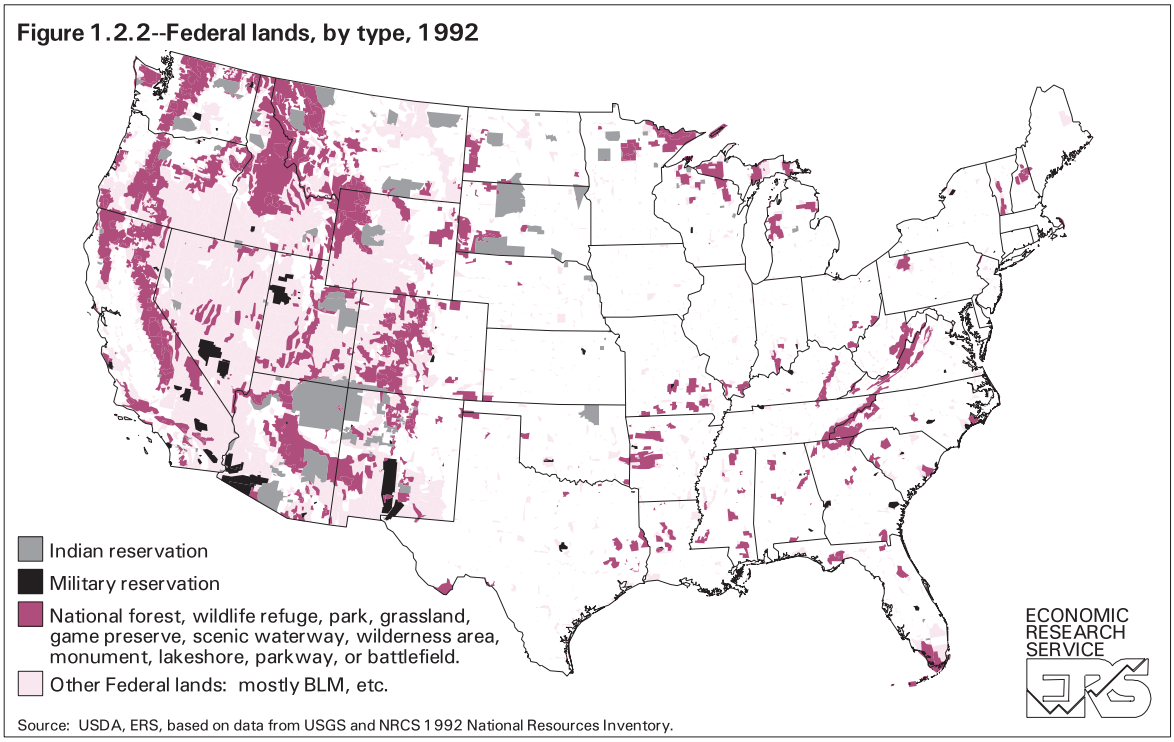
[1] Reflects a 0.8-million acre decline in Federal ownership from the 1992 total reported in table 1.2.1.

Source: USDA, ERS, based on U.S. General Services Administration, 1995.

counties. Federal land uses and conflicts are described in greater detail in chapter 1.1; Federal lands subject to conservation restrictions are discussed later in this chapter.

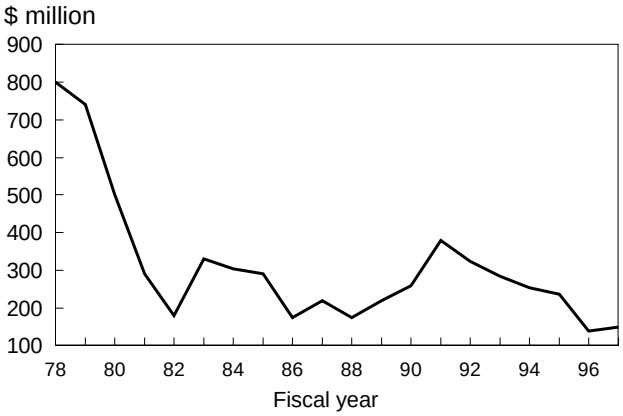
Even on lands remaining in Federal ownership, tenure is complicated by the fact that private individuals and corporations hold a variety of partial interests, including rights of way, mineral leases, and oil and gas leases (Laitos and Westfall, 1987). By contrast, grazing permits and livestock-use permits are revocable licenses, and "convey no right, title, or interest held by the United States in any land or resources" (U.S Department of Agriculture, Forest Service, 1991).

The principal source of funding for Federal land acquisitions today is the Land and Water Conservation Fund (LWCF), created by Congress in 1964 (National Research Council, 1993). LWCF appropriations have fallen from about $800 million in 1978 to $100-$400 million per year since the early 1980's; appropriations for fiscal year 1997 are $149 million (fig. 1.2.3).



As of 1992, State and local governments in the 48 contiguous States owned a total of 107 million acres (table 1.2.6), or 6 percent of the total area of the 48 States. (The differences between these data and the data in table 1.2.1 and figure 1.2.1 are accounted for primarily by Alaska, where large State holdings continue to grow as Federal land is transferred to State ownership.) State holdings were highest in the Mountain States, and local government holdings were highest in the Lake States.

Figure 1.2.3--Land and Water Conservation Fund appropriations, 1978-97



Source: USDA, ERS, compiled from National Research Council, 1993 and "Land Letter" (various years).

Foreign individuals and corporations owned 15 million acres (or 1.2 percent) of the 1.3 billion acres of privately owned agricultural land (see Glossary, p. 38) as of December 31, 1995, over half of it in the Northeast, Mountain, and Pacific States (table 1.2.7). Foreign holdings in 1995 were up slightly over 1994 and 1981 (table 1.2.8). In 1995, foreign holdings exceeded 2 percent of privately owned agricultural land in nine States, led by Maine with 16 percent. Forest land accounted for 49 percent of all foreign holdings, pasture and other noncropped agricultural land for 32 percent, cropland for 16 percent, and nonagricultural land for 3 percent. Individuals and corporations from Canada held the largest share of foreign-owned agricultural land (32 percent), followed by owners from the United Kingdom (19 percent) and Germany (11 percent) (Krupa and others, 1996).

Farmland Tenure

On private land, decades-long trends in farm size and organizational structure continued between 1987 and 1992. Land in farms (see Glossary) totaled 946 million acres in 1992, down 19 percent from a peak

of 1.2 billion acres in 1940 (Wunderlich, 1995; fig. 1.2.4). Over about the same period, the number of farmland owners declined by half, farm numbers fell by nearly three quarters to 1.9 million, and average farm size nearly tripled, to 491 acres. Farms of 500 acres or more continue to represent an increasing percentage of total farm numbers (fig. 1.2.5). Meanwhile, the percentages represented by farms of 1-49 acres and 50-499 acres have moved in opposing directions since the turn of the century, indicating a shift from the former to the latter in the 1950's and 1960's followed by a reversal in the late 1970's and early 1980's. Of the 1.9 million farms in 1992, over half were still smaller than 180 acres (table 1.2.9). Farms of 500 acres or more, representing 19 percent of all farms, accounted for 79 percent of land in farms and 55 percent of total sales. Nearly half of all farms sold less than $10,000 worth of agricultural products in 1992, while the 2 percent of farms with sales over $500,000 accounted for nearly half of total sales (fig. 1.2.6).

Table 1.2.6—Land ownership by farm production region, 48 contiguous States, 1992[1]

Region	Federal	State	Local	Indian	Private	Total
			Million acres			
Northeast	2.7	10.5	2.4	0.1	94.9	110.6
Appalachian	8.6	2.5	0.9	0.1	110.7	122.7
Southeast	8.0	4.4	1.2	0.2	108.4	122.1
Delta States	6.2	2.2	0.9	0.0	81.1	90.4
Corn Belt	3.6	2.8	2.2	0.0	154.8	163.4
Lake States	8.4	6.5	12.7	1.1	93.4	122.0
Northern Plains	6.2	3.8	1.4	4.7	177.3	193.5
Southern Plains	4.4	5.1	1.7	0.3	199.0	210.5
Mountain States	267.9	35.4	1.5	35.7	206.2	546.8
Pacific	91.6	6.7	1.9	3.7	99.6	203.5
Total	407.5	79.8	26.9	45.9	1,325.3	1,885.5

[1] All land, including urban land.
Source: USDA, ERS, based on 1992 National Resources Inventory.

Table 1.2.7—U.S. agricultural landholdings of foreign owners, 1995

Region	Acres foreign-owned	Percent of private land	Percent of total foreign holdings
Northeast	3,522,260	4.2	23.3
Lake States	744,100	0.8	4.9
Corn Belt	596,338	0.4	3.9
Northern Plains	215,055	0.1	1.4
Appalachian	669,381	0.6	4.4
Southeast	1,677,943	1.7	11.1
Delta States	1,282,343	1.6	8.5
Southern Plains	1,265,983	0.7	8.4
Mountain States	2,959,690	1.5	19.6
Pacific	1,987,972	2.1	13.2
Alaska, Hawaii, & Puerto Rico	180,972	7.2	1.2
U.S. total	15,102,037	1.2	100.0

Source: USDA, ERS, based on Krupa and others, 1996.

Table 1.2.8—Proportion of foreign-owned to privately owned agricultural land, 1981-95[1]

Selected States[2]	1981	1987	1993	1994	1995
			Percent		
Arizona	2.1	2.5	3.2	3.2	3.2
California	1.8	1.9	2.1	2.1	2.2
Florida	1.8	2.0	2.6	2.6	2.6
Hawaii	2.8	2.7	9.0	9.0	9.0
Louisiana	0.6	2.5	2.8	2.7	2.8
Maine	14.1	9.0	13.4	11.4	16.4
Nevada	0.7	0.6	3.5	3.5	4.7
New Mexico	1.9	1.6	2.2	2.2	2.2
Oregon	2.0	3.4	2.6	2.3	2.3
Total U.S.	1.0	1.0	1.2	1.1	1.2

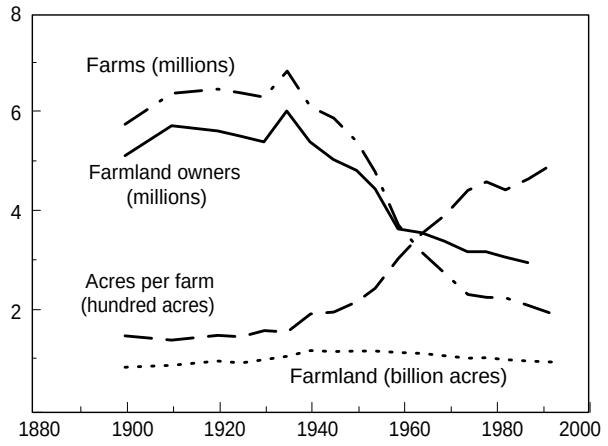
[1] As defined by 7 USC 3508, includes both farm and forest lands.
[2] States with at least 2 percent foreign ownership in 1995.
Source: USDA, ERS, based on DeBraal, 1993, and Krupa and others, 1996.

Concentration is receiving closer attention in the case of livestock production, with its associated waste management, water quality, and odor concerns (see chapter 2.2, *Water Quality*). Since 1959, for example, the number of farms on which hogs or pigs were sold has fallen by more than 85 percent (fig. 1.2.7), while the number of hogs and pigs sold has risen by 38 percent (*1992 Census of Agriculture*).

Despite the changing scale of farm operations, sole proprietorship continued to be the dominant organizational structure for farm businesses in 1992, accounting for 86 percent of farms and 64 percent of farmland, and generating 54 percent of the value of agricultural production (table 1.2.10). Even among farm corporations, nearly 90 percent were family-held in 1992. While fewer in number and smaller in total acreage than sole proprietorships, partnerships and corporations were larger on average, in terms both of acreage and of value of production.

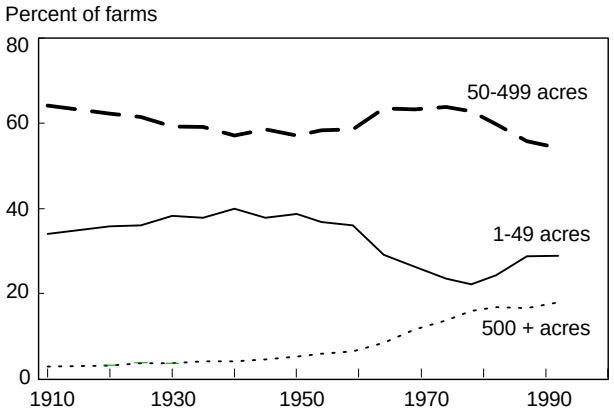
While most farm businesses are still operated as sole proprietorships, declining numbers of owners and increasing farm sizes have resulted in changing farmland ownership patterns. About 58 percent of all farms are now operated by full owners (who own all of the land they farm), 31 percent are operated by part owners (who own part of the land they farm), and 11

Figure 1.2.4--Farms, farmland, farm owners, and average acres per farm, 1900-92



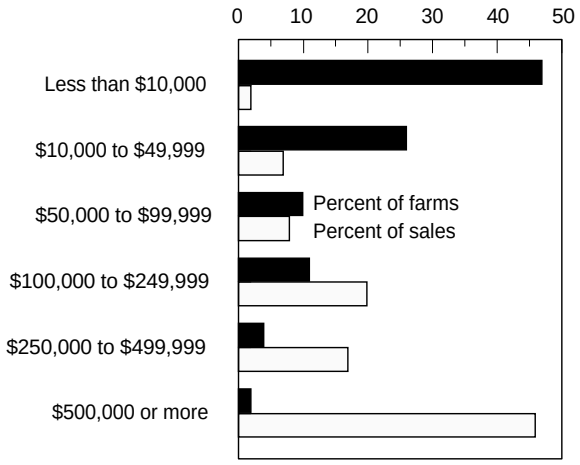
Source: USDA, ERS, based on Census of Agriculture,1954 and 1992.

Figure 1.2.5--Changing size and concentration in U.S. agriculture, 1900-92



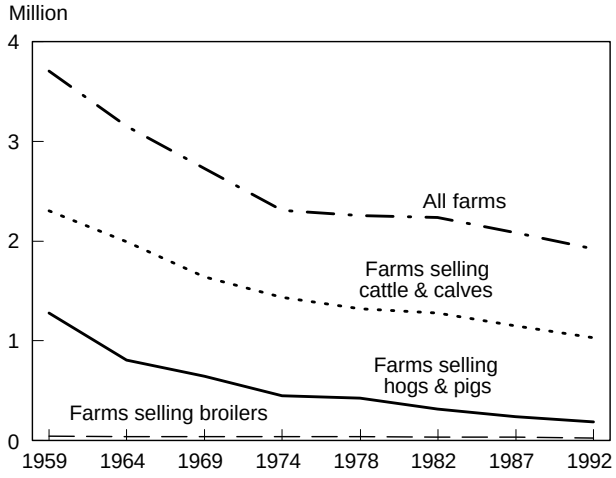
Source: USDA, ERS, based on Census of Agriculture, 1954 and 1992.

Figure 1.2.6--Distribution of farms by sales, 1992



Source: USDA, ERS, based on 1992 Census of Agriculture.

Figure 1.2.7--Livestock farm numbers, 1959-92



Source: USDA, ERS, based on 1992 Census of Agriculture.

Table 1.2.9—Size structure of U.S. farms, 1992

	Number of farms operated by				Land in farms (acres)	Total sales ($ billion)
	Full owners	Part owners	Tenants	Total		
Total	1,111,738	596,657	216,905	1,925,300	945,531,506	162.6
			Percent of total			
1-9 acres	7.2	0.4	1.0	8.6	0.1	3.0
10-49 acres	15.9	2.6	1.7	20.1	1.1	6.8
50-99 acres	10.6	2.8	1.3	14.7	2.2	5.6
100-179 acres	9.9	3.9	1.7	15.6	4.3	7.8
180-259 acres	4.6	3.2	1.1	8.9	3.9	6.2
260-499 acres	5.2	6.3	1.8	13.3	9.7	15.2
500-999 acres	2.5	5.8	1.4	9.7	13.7	19.8
1,000-1,999 acres	1.0	3.5	0.7	5.3	14.7	16.3
2,000+ acres	0.8	2.4	0.5	3.7	50.4	19.3
All farms	57.7	31.0	11.3	100.0	100.0	100.0

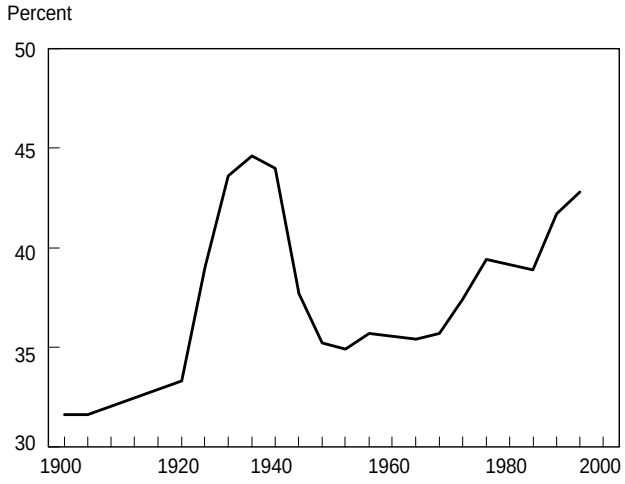
Source: ERS, USDA, based on 1992 Census of Agriculture.

percent are operated by tenants (who rent all of the land they farm) (table 1.2.9). While full owners outnumbered part owners and tenants in 1992, part owners operated larger farms on average (883 acres) than either full owners (266 acres) or tenants (566 acres) (*1992 Census of Agriculture*). Three-quarters of full owners operate farms smaller than 180 acres, while two-thirds of part owners operate farms of 180 acres or more. Between 1987 and 1992, part owners increased both as a share of total farm operators (29 to 31 percent) and in terms of the share of total land in farms they operated (54 to 56 percent).

The growth in part ownership reflects the increasing importance of leasing as a means of access to farmland. Farmland may be rented *out* for a variety of reasons, for example, as an investment by a nonoperating owner or as a reduction in the scale of operation by a farmer approaching retirement. Farmland may also be rented *in* for a variety of reasons. For example, it allows farmers to avoid tying up equity capital in land, reduces risk associated with asset depreciation, increases management flexibility in overall size of operation and combination of land types, and provides a means of entering agriculture (Rogers, 1991). Of the 946 million acres of farmland in 1992, nearly 43 percent (405 million acres) were rented by farm operators, up from 35 percent in 1954 and the highest proportion since 1940 (Wunderlich, 1995; fig. 1.2.8). About 282 million acres were rented by part owners, and 123 million acres were rented by tenants.

The increase in farmland leasing has occurred alongside an increase in land ownership by nonfarmers. Land owned by nonfarming landlords increased to 37 percent of all farmland in 1992, or 350 million acres, up from 36 percent in 1987 (Wunderlich, 1995). The importance of nonfarming landlords is evident in the nature of lease arrangements: nonfarming landlords may be less involved in farming decisions than are landlords who are farmers themselves, and this lesser degree of

Figure 1.2.8--Leased farmland as a percentage of total farmland, 1900-92



Source: USDA, ERS, based on Wunderlich, 1995.

Table 1.2.10—Farms, land in farms, and value of production by type of business organization, 1992

Type of organization	Farms		Land in farms			Value of production		
	Number	*Percent*	*Acres (million)*	*Percent*	*Acres per farm*	*Total sales ($ billion)*	*Percent*	*Sales per farm ($1,000)*
Sole proprietorship	1,653,491	85.9	604.3	63.9	365	87.9	54.0	53.2
Partnership	186,806	9.7	152.8	16.2	818	29.3	18.0	157.0
Corporation	72,567	3.8	122.7	13.0	1,692	44.2	27.1	608.8
Family-held	64,528	3.4	110.8	11.7	1,718	34.4	21.1	533.0
Other	8,039	0.4	11.9	1.3	1,484	9.8	6.0	1217.7
Other	12,436	0.6	65.7	6.9	5,280	1.2	0.7	97.7
Total	1,925,300	100.0	945.5	100.0	491	162.8	100.0	84.5

Source: USDA, ERS, based on 1992 Census of Agriculture.

involvement may favor cash leases rather than crop-share leases. In 1992, cash rents were paid on 65 percent of rented farms, or 27 percent of all farms.

The simultaneous growth in farm size, farmland leasing, and part ownership—particularly the predominance of part ownership among larger farms—suggests that tenure arrangements may be evolving to accommodate larger operational holdings necessary for viable farming. The resulting decline in landowner participation in farming decisions may have important implications for conservation since owner-operators may differ from renter-operators in their incentives to use and conserve land.

Research on the relationship between tenure and adoption of conservation practices has produced mixed findings. Conventional expectations that owner-operators are more likely than renter-operators to adopt conservation practices are supported in some circumstances but not in others. Recent Cropping Practices Survey data show that the impact of tenure on adoption varies with the nature of particular conservation practices as well as by crop, HEL (highly erodible land) designation, and farm program participation (table 1.2.11).

Table 1.2.11—Adoption of selected conservation practices in major producing States, 1994[1]

Practice	Corn (10 States)		Soybeans (8 States)		Seven crops (28 States)	
	Owner-operator	Renter-operator	Owner-operator	Renter-operator	Owner-operator	Renter-operator
Number of observations	2,084	2,612	1,246	1,891	5,296	6,812
			Percent of observations			
Highly erodible land	20.3	18.1	18.7	16.8	24.0	21.0
Mulch tillage, 30% residue	22.0	23.2	27.7	23.1	21.7	19.9
No till	14.9	18.8	23.8	24.3	12.6	15.0
Ridge till	2.2	2.7	0.5	0.5	0.9	1.1
Row crops & small grains[2]	4.5	3.8	4.6	4.9	9.6	8.3
Hay, pasture, other[1]	10.1	4.5	2.5	3.3	5.5	3.1

[1] For States and crops included, see "Cropping Practices Survey" in the appendix.
[2] As part of a 3-year crop rotation.
Source: USDA, ERS, 1994 Cropping Practices Survey data.

Federal Restrictions on the Use of Public and Private Land

Land tenure involves more than land ownership. To balance landowners' rights with the rights of other members of society, rights to use land may be limited by government regulations, zoning ordinances, conservation easements, contracts, or other instruments that arise out of law, custom, and the operation of private markets (see box, "The Private Property Rights Issue"). This holds true whether the landowner is a private individual or the Federal Government.

For example, as of 1993, 96 million acres of Forest Service, BLM, FWS, and NPS land had been designated as wilderness by Congress, restricting the use of motorized equipment, construction of buildings and roads, development of commercial enterprises, and other activities (U.S. General Accounting Office, 1995). Another 33 million acres had been designated as wilderness study areas, providing interim protection until Congress makes a final decision on their status. In all, 44 percent of Federal lands (271 million acres, including all 164 million acres managed by FWS and NPS) are encumbered for conservation purposes by legislative or administrative restrictions.

Federal programs also seek to encourage conservation on privately owned land through both regulatory and nonregulatory means. Through Conservation Reserve Program (CRP) contracts and Wetlands Reserve Program (WRP) easements, the Federal Government acquires cultivation rights from willing farmers and farmland owners in an effort to reduce soil erosion, protect wildlife habitat, and improve water quality. The Endangered Species Act and the Clean Water Act regulate the ways in which landowners may use their land. (These instruments, as well as other policy tools, are discussed further in chapters 6.1-6.5) Most CRP contract holders own the land on which they hold CRP contracts. In 1993, 72 percent of CRP contract holders (controlling 70 percent of CRP acres) were owner-operators, 16 percent (controlling 15 percent of CRP acres) were owner-nonoperators, and 5 percent (controlling 7 percent of CRP acres) were renter-operators (Osborn, Schnepf, and Keim, 1994). WRP participation is limited to landowners. In addition, Federal tax code provides income and estate tax benefits for landowners who donate interests in environmentally valuable land to qualified conservation organizations.

The Private Property Rights Issue

Property rights are the building blocks of land tenure. Property rights may be held publicly, as in federally owned national forests; held privately, as in most U.S. farmland; or held in combination, as when a government agency acquires a conservation easement on private land. A particular landowner may hold the rights to use his or her property for various purposes and to receive benefits or profits from those uses. Those rights generate value. Because a landowner's actions on his or her land may also generate adverse effects beyond the parcel's boundaries, however, the rights of each landowner are generally limited by the rights of other landowners and the rights of other members of society. These limitations take the form of local, State, and Federal restrictions on land use.

Private property is protected by the Constitution's Fifth Amendment, which states that private property shall not be taken for public use without just compensation. Only physical appropriations of property were viewed as "takings" until 1922, when the Supreme Court ruled that regulation could also be considered a taking if it went "too far" (*Pennsylvania Coal Company v. Mahon*). Even so, the courts have considered a regulation's impact on a property's value as only one among several criteria—such as the nature of the public purpose accomplished by the regulation—in determining whether a taking has occurred.

Legislation recently considered by Congress would require the Federal Government to compensate landowners whenever Federal restrictions on land use cause property values to fall by more than a threshold percentage (Wiebe, Tegene, and Kuhn, 1995). Such legislation would have established diminution in value as a sufficient criterion by which takings could be determined, regardless of other economic and legal criteria. Most States have also considered takings legislation in recent years, and 20 States have now enacted takings bills. Most of the bills passed by State legislatures require "takings impact assessments" rather than compensation for diminished property values, but six States (Florida, Louisiana, Mississippi, Oregon, Texas, and Washington) passed compensation bills in 1995 (*Land Use Law Report*, 1995). Oregon's bill was vetoed by the Governor in July 1995, and Washington's was defeated in a referendum in November 1995, a year after voters defeated a similar measure in Arizona (American Resources Information Network, 1997).

Table 1.2.12—State farmland preservation programs, 1996

State	Year established	Acres preserved	Number of farms	Average cost per acre[2]
Maryland	1977	122,068	837	$877
Massachusetts	1977	37,445	409	$2,718
Connecticut	1978	25,192	165	$2,951
New Hampshire[1]	1979	8,469	127	n.a.
Rhode Island[1]	1982	2,428	30	$5,766
New Jersey	1983	28,713	195	$3,236
Pennsylvania	1988	76,360	611	$2,113
Vermont	1988	36,580	111	$598
Maine[1]	1990	307	1	$1,238
Delaware	1991	8,500	31	n.a.
Kentucky	1994	0	0	--
Total	1977-94	346,062	2,517	n.a.

n.a. means not available; -- means not applicable.
[1] Data as of July 1995.
[2] Current dollars.

Apart from its treatment of conservation easements in the tax code, the Federal Government's role in farmland preservation consists of three pieces of legislation. The Farmland Protection Policy Act, part of the 1980 Farm Act, requires Federal agencies to identify and minimize adverse effects of their programs on farmland preservation and to ensure compatibility with State, local, and private farmland preservation programs. The Farms for the Future Act, part of the 1990 Farm Act, authorizes the establishment of an Agricultural Resource Conservation Demonstration Project, which provides Federal loan guarantees and interest rate assistance for State trust funds through the Farmers Home Administration. So far only Vermont has been given authority to participate. In 1996, the Federal Agriculture Improvement and Reform Act increased direct Federal participation in farmland protection by establishing a Farmland Protection Program at the Federal level. This program is to protect 170,000-340,000 acres of prime, unique, or other farmland through USDA acquisition of easements or other interests in farmland, with funding of up to $35 million from the Commodity Credit Corporation. About $14 million has been spent so far to help acquire easements on 76,000 acres in 17 States.

Non-Federal Programs to Preserve Land

State and local government agencies and nongovernmental organizations also acquire partial interests in private land for conservation purposes, including the preservation of farmland, wetlands, and wildlife habitat. Farmland preservation programs, which seek to retain land in agricultural use when land values rise due to urban pressure, operate primarily at the State and local levels.

One method used by State governments is to tax agricultural, forest, and open lands based on their current-use value rather than on their market value (which might reflect development pressure). Beginning with Maryland in 1956, all 50 States have now established programs that provide preferential property tax treatment for agricultural land (Malme, 1993; Aiken, 1989). Twenty States have "pure preferential programs," which provide special treatment while land remains in agricultural use but extract no penalty when land use changes. Other States impose deferred or "roll-back" taxes plus penalties when land is converted in order to recover at least a portion of the difference between the taxes paid and the taxes that would have been due without preferential treatment. Preferential property tax treatment programs have generally had a limited effect in preventing conversion of farmland to more intensive uses because the tax benefits offered have not matched the profits available from conversion in areas experiencing development pressure (Malme, 1993).

In addition to property, income, and estate tax incentives for farmland preservation, public and private agencies also prevent farmland conversion through acquisition of agricultural conservation easements. Conservation easements are restrictions on land use voluntarily negotiated between landowners and conservation organizations (both

Table 1.2.13—County farmland preservation programs, 1995[1]

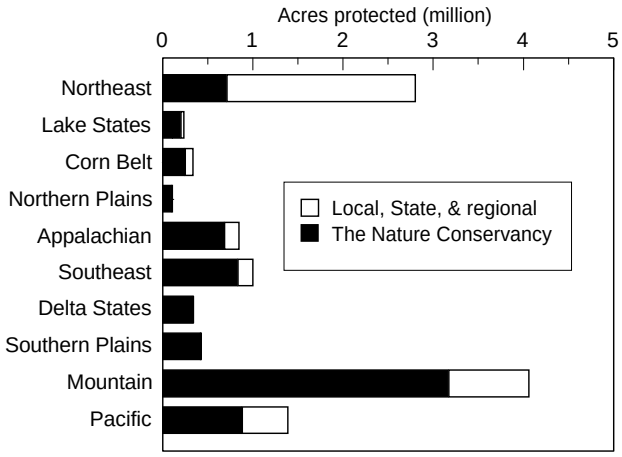
County	Farms preserved to date	Acres preserved to date
Montgomery (MD)	n.a	46,813
Marin (CA)	38	25,504
Carroll (MD)	184	24,604
Lancaster (PA)	260	22,000
Sonoma (CA)	48	21,000
Howard (MD)	142	20,119
Caroline (MD)	131	18,350
Harford (MD)	n.a.	16,861
Baltimore (MD)	107	11,714
Queen Anne's (MD)	53	10,411

n.a. means not available.

[1] These data overlap to an undetermined extent with the State data in table 1.2.12.

Source: USDA, ERS, based on *Farmland Preservation Report*, 1996.

Figure 1.2.9--Land protected by land trusts as of 1994



Source: Compiled by ERS from Wiebe (1995).

public and private) that are binding on current and future landowners over a specified period of time. State and county programs generally acquire farmland preservation easements at fair market value, defined as the difference between the fair market value of the land unencumbered by an easement and the value of the land in agricultural use (Wiebe, Tegene, and Kuhn, 1996). Farmland preservation programs using easement acquisition have been established in 11 States to date, beginning with Maryland in 1977 (table 1.2.12). Maryland's is the largest program, protecting over 122,000 acres on over 800 farms so far. The State programs together have protected over 346,000 acres on over 2,500 farms, at average costs ranging from $598 per acre in Vermont to $5,766 per acre in Rhode Island. County farmland preservation programs are also active in many States, although the Nation's 10 largest county programs are concentrated in Maryland, California, and Pennsylvania (table 1.2.13).

Farmland preservation is also a goal of many land trusts, nonprofit conservation organizations that protect land from more intensive uses through direct involvement in voluntary land transaction activities (Wiebe, 1995). Over 1,000 land trusts operate at the local, State, or regional level, protecting 4 million acres through land ownership, conservation easements, and land transfers to government agencies. A few land trusts operate nationwide. The largest of these, The Nature Conservancy, specializes in the preservation of biodiversity, protecting 8 million acres in the United States. Other national land trusts had protected 2 million acres as of 1994. Acreage protected by The Nature Conservancy was highest in the Mountain States, at 3.2 million acres (fig. 1.2.9). Acreage protected by local, State, and regional land trusts was highest in the Northeast, at 2.1 million acres.

The number of local, State, and regional land trusts grew by 30 percent between 1990 and 1994, to 1,145. Acreage protected grew by 49 percent over the same period. About 0.6 million acres were owned by such land trusts, 0.9 million acres were transferred to other private or government conservation agencies, 0.8 million acres were protected by conservation easements, and 1.8 million acres were protected by other means. Acreage protected by The Nature Conservancy increased by 51 percent between 1990 and 1994. About 0.7 million acres were owned, 2.6 million acres had been transferred to other conservation agencies, 0.6 million acres were protected by conservation easements, 1.8 million acres were protected under lease or management agreements, and 2.1 million acres were protected by other means.

The ultimate success of public agencies and private organizations in using easements and other partial interests in land to protect environmentally sensitive areas depends on the specific land-use restrictions that individual agreements contain. These restrictions may vary widely from one agreement to the next. Program success also depends on the strictness with which these restrictions are monitored and enforced.

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Glossary

Cropland—Farmland in crop rotations, including cropland used for crops, idle cropland, and cropland used for pasture only, totaling 460 million acres in 1992 (Daugherty, 1995; table 1.2.1).

Family farm—A variety of characteristics have been used to describe family farms, but none has gained widespread acceptance. Among these characteristics are the extent to which a single family owns or controls farm assets, provides management and labor, and accepts risk, as well as the extent to which the farm business is the family's principal source of income. The relative emphasis placed on each criterion varies widely and has been the subject of some controversy (for example, in debates over who should receive farm program benefits). Only the Farmers Home Administration currently uses a family farm definition as a qualifier for a government program, based very broadly on farm income and family contributions to management and labor (*Code of Federal Regulations*, §1941.4).

Farm—The *Census of Agriculture* defines a farm as any place from which $1,000 or more of agricultural products were sold or normally would have been sold during a year. There were 1.9 million such farms in 1992 (*1992 Census of Agriculture*, 1994; table 1.2.9; fig. 1.2.4).

Farmland—Land in farms (see above) as determined by the *Census of Agriculture*, totaling 946 million acres in 1992 (table 1.2.9; fig. 1.2.4).

Land in farms is used interchangeably with farmland (see above).

Privately owned agricultural land—All private lands (table 1.2.1) less transportation and urban lands (Krupa and others, 1996). Includes cropland, pastureland, forest land, and rangeland, and totaled 1.3 billion acres in 1995.

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Recent ERS Reports on Land Tenure Issues

Partial Interests in Land: Policy Tools for Resource Use and Conservation. AER-744, Nov. 1996 (Keith Wiebe, Abebayehu Tegene, and Betsey Kuhn). Partial interests in land, such as conservation easements, are increasingly used by public and private agencies to balance resource use and conservation objectives on environmentally sensitive land without incurring the political costs of regulation or the financial costs of outright land acquisition. Examples described in this report include the Conservation Reserve Program, the Wetlands Reserve Program, and State and local farmland protection programs.

Land Trusts Protected 14 Million Acres as of 1994, AREI Update, 1995, No. 13 (Keith Wiebe). The Nature Conservancy and other national land trusts protected about 10 million acres as of 1994 through ownership, easements, and other means. Local, State, and regional land trusts protected an additional 4 million acres. Data are reported by State and region.

Foreign Ownership of U.S. Agricultural Land Through December 31, 1995, SB-931, Oct. 1996 (Kenneth Krupa, Charles Barnard, and Jacqueline Ross). Foreign persons or U.S. corporations in which foreigners held a significant interest owned 15.1 million acres of U.S. agricultural land in 1995, about 1 percent of all privately owned agricultural land in the United States. Data are reported by State and by foreign country.

"Farmland Rentals: Central to Farming," *Agricultural Outlook*, July 1995 (Bob Hoppe, Bob Green, and Gene Wunderlich). Data from the 1992 Farm Costs and Returns Survey indicate that about 40 percent of land in farms is rented, most through cash leases. Renting helps young farmers gain access to land and helps spread some of the risks of farming.

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Purchase of Development Rights and the Economics of Easements, AER-718, June 1995 (Henry Buist, Carolyn Fischer, John Michos, and Abebayehu Tegene). By the end of 1992, State or county governments in 15 States had developed programs to purchase development rights from farmland owners, primarily in the Northeast. Program goals, procedures, and achievements are discussed, along with the role of private land trusts and of Federal tax incentives for donation of conservation easements.

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(Contact to obtain reports: Keith Wiebe, (202) 501-8283 [kdwiebe@econ.ag.gov])

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1.3 Land and Soil Quality

Maintaining and improving the quality of the Nation's soils can provide economic benefits in the form of increased productivity, more efficient use of nutrients and pesticides, improvements in water and air quality, and the storage of greenhouse gases. Economic measures of soil quality are needed to monitor and assess the effects of agricultural activities on soil properties. While measures of land capability, productivity, and erodibility are well known, there is an increasing emphasis on soil quality measures that incorporate properties more fully reflecting a soil's potential for long-term agricultural production without negative environmental impacts.

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Maintaining and improving the quality of the Nation's soils can increase farm productivity, minimize use of nutrients and pesticides, improve water and air quality, and help store greenhouse gases. Developing economic measures of soil quality requires a better understanding of the multiple functions of soils and of the interaction between agricultural activities and soil quality. For example, productivity measures reflect the private concerns surrounding soil quality, but other concerns, such as surface-water pollution from runoff, soil productivity for future generations, and the health of agricultural and rural ecosystems, are of broader national interest—and greater economic importance—and need to be reflected in new measures of land and soil quality. Combining the many physical attributes of land and soil quality into meaningful indicators is difficult, as is assigning economic values to these indicators. But only when economic values are generated for these indicators can we fully assess the trade-offs associated with alternative private and public actions.

Traditional Measures of Quality

Soil quality definitions currently follow two concepts (Karlen and others, 1997; Seybold and others, 1997). The first is the "capacity of the soil to function" (Doran and Parkin, 1994). The second is "fitness for use" (Pierce and Larson, 1993; Acton and Gregorich, 1995). "Capacity of the soil to function" refers to the inherent properties of soil formation, which include climate, topography, vegetation, and parent material. These are measured in soil surveys by characteristics such as texture, slope, structure, and soil color (USDA, 1993). "Fitness for use" is a dynamic concept and relates to soils as influenced by human use and management. This concept is often termed soil health or condition. Measures of soil quality such as Land Capability and Prime Farmland are thought to reflect the inherent properties of soil and are based on crop production. Other criteria are needed for other uses of land. The potential capacity of a soil to function must be assessed before a soil's fitness for use can be measured (Mausbach, 1997). Measures of land and soil quality should also account for scale, both spatial and temporal (Halvorson, Smith, and Papendick, 1997). Scale is important

Table 1.3.1—Cropland and soil quality, selected measures, 1992[1]

Measure	Cultivated cropland	CRP	Total	Cultivated cropland	CRP	Total
	1,000 acres			*Percent of acres*		
Land capability class in 1992:						
I (highest land quality)	26,945	214	27,159	7.0	0.6	6.5
II	177,337	7,584	184,921	46.4	22.3	44.4
III	116,687	14,240	130,927	30.5	41.8	31.4
IV and above (lowest quality)	61,349	12,001	73,350	16.1	35.3	17.6
Total	382,317	34,040	416,357	100.0	100.0	100.0
Prime farmland in 1992	215,731	9,688	225,419	56.4	28.5	54.1
Erodibility in 1992:[2]						
Highly erodible from water only	51,924	na	na	13.5	na	na
Highly erodible from wind only	48,933	na	na	13.0	na	na
Highly erodible from both	3,516	na	na	0.9	na	na
Subtotal highly erodible	104,373	19,796	124,169	27.4	58.2	29.8
Not highly erodible	277,944	14,244	292,188	72.3	41.8	70.2
Total	382,317	34,040	416,357	100.0	100.0	100.0

[1] Includes cultivated cropland and land enrolled in the Conservation Reserve Program (CRP) in the contiguous States, Hawaii, and the U.S. Caribbean islands (less than 0.75 million acres).

[2] Highly erodible land has an erodibility index for sheet and rill erosion or for wind erosion greater than or equal to 8.

Source: USDA, ERS, analysis of NRCS 1992 National Resources Inventory data.

because soil quality changes over time and is different by region. Some traditional measures of land quality are discussed in this section.

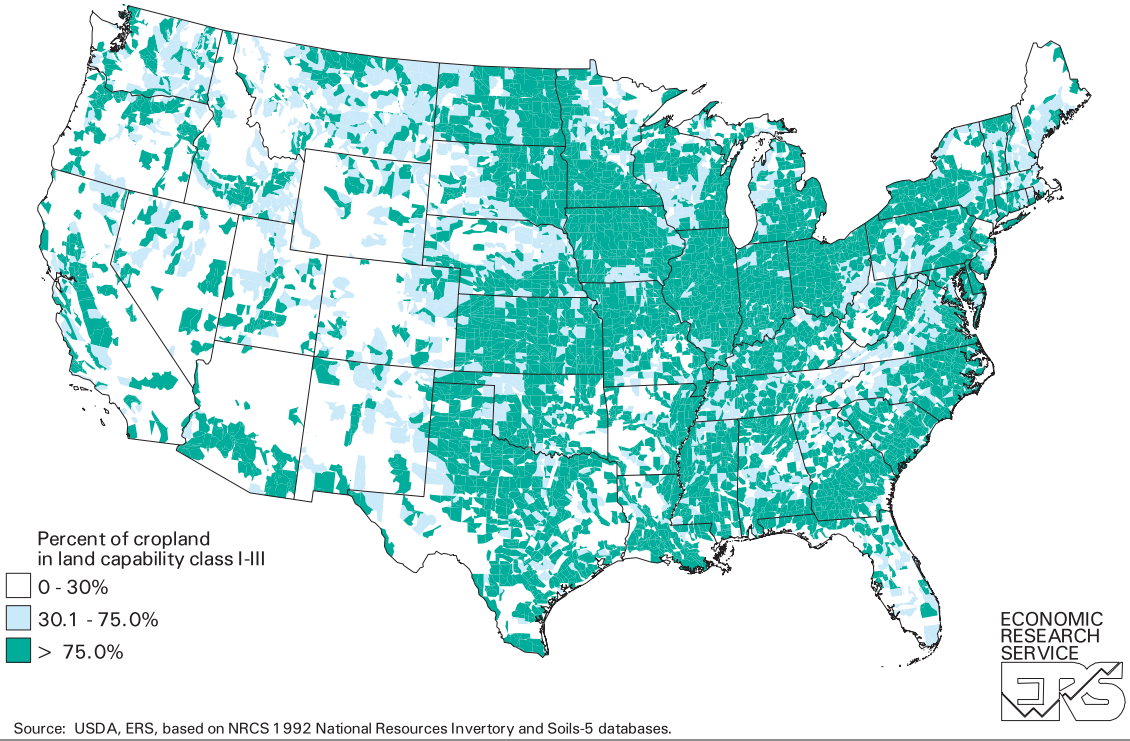
Land Capability and Suitability. Some measures of land quality are used to monitor the capability or suitability of land for a particular purpose, such as growing crops or trees, grazing animals, or nonagricultural uses. Data on two commonly used measures—land capability classes (LCC) and the prime farmland designation—have been collected in the National Resources Inventory (NRI), conducted by USDA's Natural Resources Conservation Service (NRCS) every 5 years (USDA, 1994 and 1989b). (See appendix for a description of the NRI.)

Land capability classes range from I to VIII. Class I, about 7 percent of U.S. cropland, has no significant limitations for raising crops (table 1.3.1). Classes II and III make up just over three-fourths of U.S. cropland and are suited for cultivated crops but have limitations such as poor drainage, limited root zones, climatic restrictions, or erosion potential. Class IV is suitable for crops but only under selected cropping practices. Classes V, VI, and VII are best suited for pasture and range while Class VIII is suited only for wildlife habitat, recreation, and other nonagricultural uses (USDA, 1989a). Land capability classes I-III total 343 million acres, or 82 percent of U.S. cropland including land in the Conservation Reserve Program but excluding Alaska (fig. 1.3.1, table 1.3.1).

Prime Farmland. Another measure of land suitability is USDA prime farmland, which is based on physical and morphological characteristics such as depth of the water table in relation to the root zone, moisture-holding capacity, the degree of salinity, permeability, frequency of flooding, soil temperature, erodibility, and soil acidity. Land classified as prime farmland has the growing season, moisture supply, and soil quality needed to sustain high yields when treated and managed according to modern farming methods (USDA, 1989a). Prime farmland totals 225 million acres, or 54 percent of U.S. cropland, excluding Alaska (fig.1.3.2, table 1.3.1).

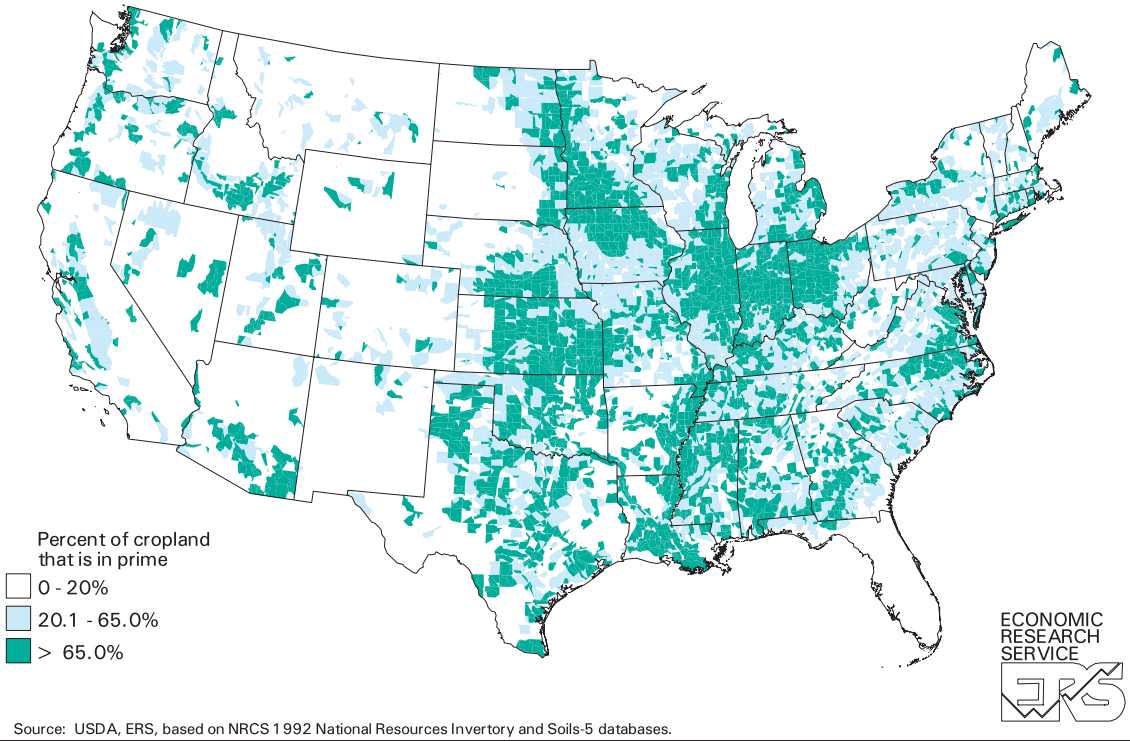
These measures of land quality are often confused with the capability of land to produce economic returns. Land in capability classes I-III or prime farmland does not necessarily have the highest value of crop production per acre (see Vesterby and Krupa, 1993). Alternatively, lands earning high economic returns may not be classified as prime farmland or in LCC I-III. For example, prime and LCC are based on characteristics that reflect suitability for row crop production. Florida and Arizona have little prime

Figure 1.3.1--Distribution of cropland in land capability classes I,II and III on rural nonfederal land



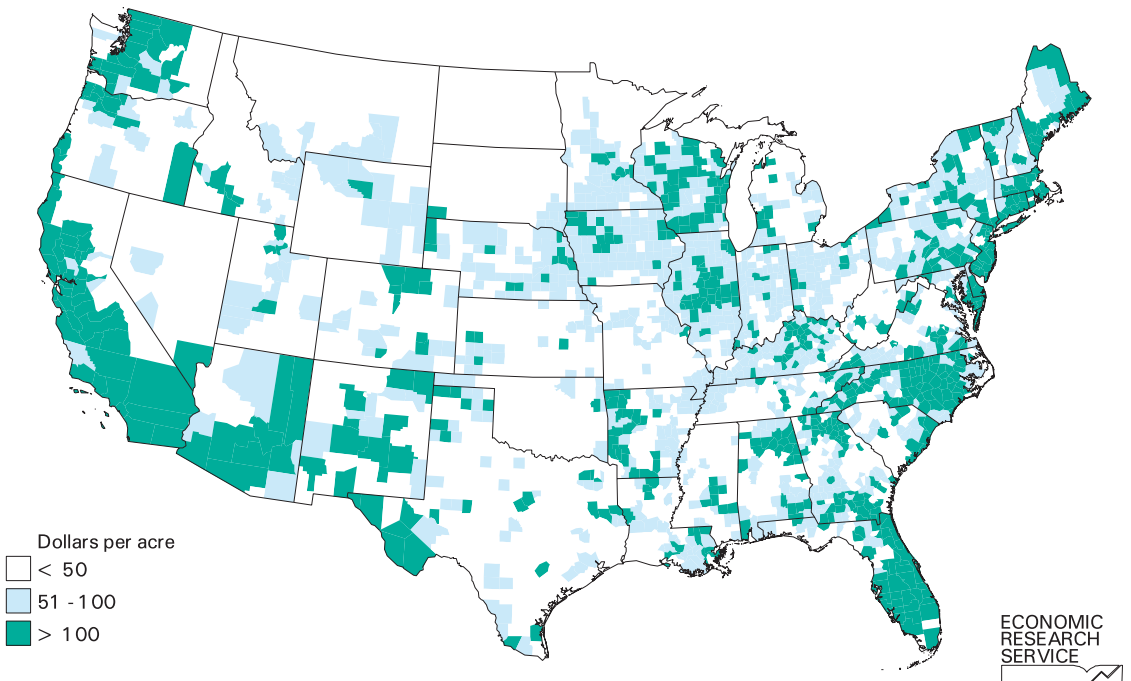
Source: USDA, ERS, based on NRCS 1992 National Resources Invertory and Soils-5 databases.

Figure 1.3.2--Distribution of prime cropland on rural, nonfederal land



Source: USDA, ERS, based on NRCS 1992 National Resources Invertory and Soils-5 databases.

Figure 1.3.3--County average net cash return per acre of cropland



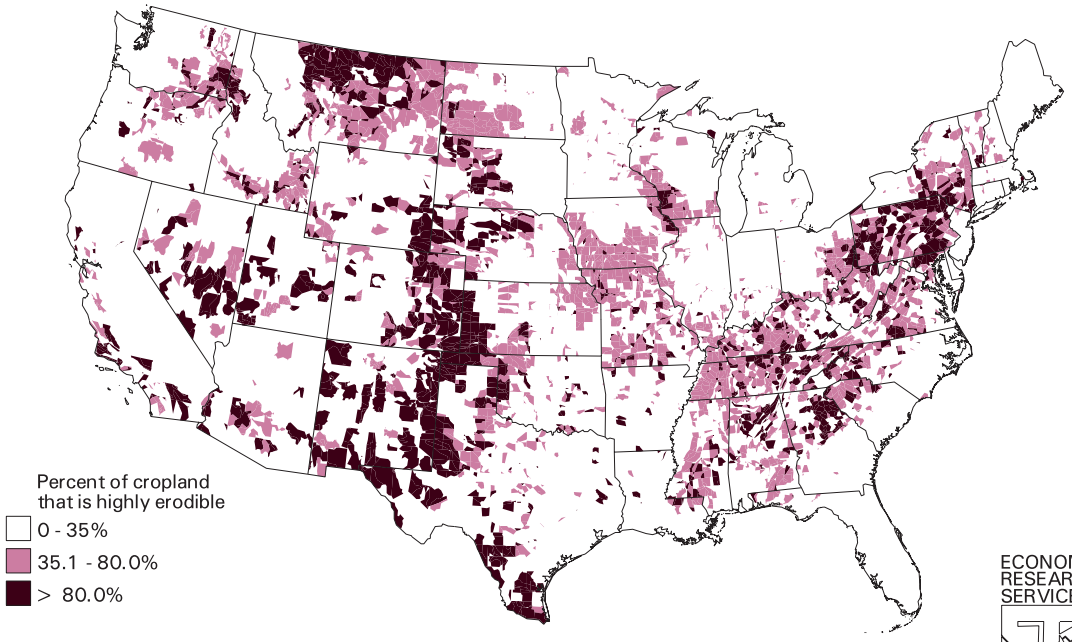
Source: USDA, ERS, based on USDC 1992 Census of Agriculture.

farmland or land in LCC I-III, but these areas rank among the most economically productive in the Nation. (New irrigation will sometimes change a classification from nonprime to prime if other soil characteristics needed for a prime classification are present.)

Productivity. Soil productivity, which measures output per unit of input, is often the primary reason for monitoring soil erosion (or other degradation processes) and is itself a measure of soil quality. Productivity is often measured as crop yield per acre**.** Another indicator of land quality is the expected net returns per acre from production (dollar returns to production net of cash production costs). Highest values are in coastal areas where climate, soil, location, and irrigated conditions favor production of perishable crops (fruits and vegetables), or where integrated livestock operations draw from an extended cropping area (fig. 1.3.3). The next most productive lands are in the Corn Belt, Lake States, the Northeast, and Southern Coastal Plain. The least productive lands, by this net returns measure, are in bands across the Northern Plains and Central Plains. Productivity can reflect soil degradation if yields decline as soils become degraded or if input use increases to compensate for declines in soil quality. However, productivity often masks environmental or health components of soil quality; lands of poor physical quality (as measured by erosion, texture, organic matter) can sometimes produce very high yields without large increases in input use (Vesterby and Krupa, 1993).

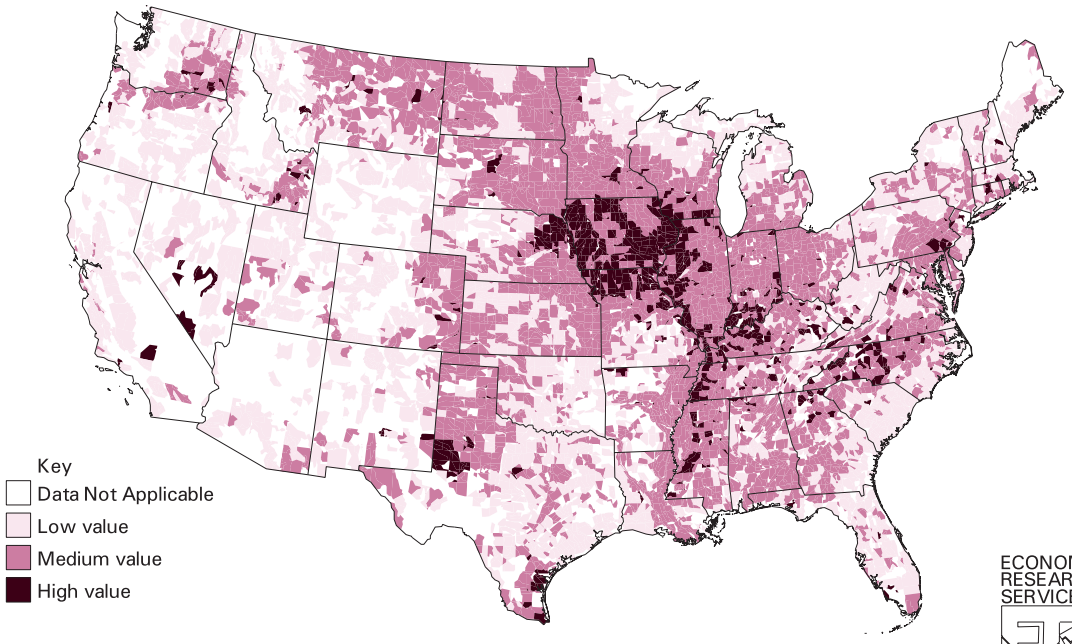
Erodibility. A commonly used measure of soil quality is highly erodible land (HEL), which is of particular importance for USDA conservation policy (see chapter 6). Because the actual tons of wind- and water-eroded soil do not usefully measure the erosion potential on particular soils, USDA uses the erodibility index (EI) to inventory and classify erosion potential and to determine conservation program eligibility. Highly erodible soils have the potential for erosion because of relatively unchanging physical attributes. Associated with sheet and rill erosion are rainfall pattern, soil texture, and topography; associated with wind erosion are climatic and soil erodibility factors. Erosion rates can be reduced if hay or close-grown crops are grown, if tillage methods are used with appropriate crop residue management, and if conservation practices are employed. An assessment of erosion needs to consider both the physical potential for erosion and the erosion rates resulting from management choices.

Figure 1.3.4--Distribution of highly erodible cropland on rural, nonfederal land



Source: USDA, ERS, based on NRCS 1992 National Resources Inventory and Soils-5 databases.

Figure 1.3.5--Value of onsite soil productivity loss



Dryland cash rent divided by years of topsoil depth remaining at current erosion rates.
Source: USDA, ERS, based on NRCS 1992 National Resources Inventory.

Highly erodible lands are more vulnerable to soil quality problems, but if erosion is controlled, they may be productive soils. Any soils that are eroding are considered to have lower quality than similar soils that are protected from erosion. Soil quality suffers on eroding soils, but simply controlling erosion does not necessarily translate to high-quality soils since compaction, acidity, salinization, and biological factors play a part in the quality of the soil (Mausbach, 1997).

The EI divides potential erosion (sheet and rill, or wind) by the soil loss tolerance factor (T-level, the rate of soil erosion above which long-term soil productivity may be depleted) to reflect erosion potential relative to vulnerability to productivity loss. (Heimlich and Bills, 1989; McCormack and Heimlich, 1985). Highly erodible land (HEL) is defined by USDA as cropland with a natural erosion potential of at least eight times its T-level. According to the 1992 NRI, 124 million acres of cultivated cropland and CRP land are highly erodible from water, wind, or both (table 1.3.1). However, for purposes of administering the conservation compliance provision of the 1985, 1990, and 1992 Farm Acts, USDA's NRCS has classified 146 million acres as HEL, which includes some 22 million acres of other soils in fields that are primarily highly erodible soils (for more information on Conservation Compliance, see chapter 6.4). Highly erodible soils are found in all States (fig. 1.3.4).

Another measure of productivity loss due to erosion converts total erosion from tons per acre per year to inches per year. The rate of expected soil loss in inches is divided into the topsoil depth (the A horizon) recorded in the Soil Interpretation Record (SOILS 5) (USDA, 1983). This measures how many years it would take to remove the topsoil at the current rate of erosion (on the extreme assumption that all the eroded soil is removed from the field). Multiplying the inverse of this measure by the cash rental rate for cropland reflects the relative economic value of soil productivity loss due to erosion. Three factors are reflected in this measure: erosion rates, soil depth, and rental values of land. Low erosion rates or deep, long-lasting topsoils are given less weight, and highly productive (high rental rate) but vulnerable soils (thin topsoil, high erosion rate) are given more weight (fig. 1.3.5). This indicator suggests four regional concentrations of vulnerable soils, the largest centered on Iowa, Illinois, and Missouri in the Corn Belt. This region's index values are largely driven by the region's relatively high rental rates. While erosion rates are moderate in this region, the soil is relatively valuable. A second concentration is the eastern bluffs of the Mississippi River in western Kentucky, Tennessee, and along the eastern edge of the Mississippi Delta. A third concentration is the irrigated cotton area of the Texas Panhandle, stretching up to the eastern edge of Colorado. The final concentration is a band of highly erodible and highly valued land in eastern Washington and Oregon around the Palouse and Central Plateau.

The major onsite effect of soil erosion is the impact on soil productivity. Research conducted in the 1980's has improved our understanding of the long-term relationship between erosion and productivity (AAEA, 1986). The 1987 RCA estimated that, under 1982 management conditions, agricultural productivity would decline about 3 percent over the next 100 years, due to soil erosion. Productivity loss would be concentrated on soils eroding at high tolerance values or on very fragile soils where even slight erosion can result in large declines in yields (USDA, 1989a). Soil erosion also contributes to off-farm sediment damage, estimated at $2-$8 billion annually (Ribaudo, 1986).

Vulnerability. Interest in soil erosion and its associated costs has been coupled with an increasing interest in the loss of nutrients, pesticides, and salts from farming systems to surface and ground water (NAS, 1993). For example, indices to assess the potential for groundwater contamination related to agricultural chemical use (Kellogg, Maizel, and Goss, 1992) incorporate variables that reflect the propensity of soils to leach pesticides and nitrates. The Ground Water Vulnerability Indexes for Pesticides and Nitrogen are functions of soil leaching potential, pesticide and nitrogen properties, precipitation, and chemical use. The Corn Belt, Southeast, and Lake States have more acreage vulnerable to pesticide leaching, while the Northern and Southern Plains show more acreage with a potential for nitrate leaching (see figs. 2.2.2 and 2.2.4 in chapter 2.2, *Water Quality*).

Land capability classes, prime farmland, and highly erodible land designations are useful in determining how land might be used or the degree and location of erosion, but they are limited in that they exclude other important characteristics of soils and pertain mostly to cropland. Productivity measures, such as yields per acre, or profitability measures, such as cash rents, provide fairly direct indicators of the utility of land for producers wishing to maximize the return on their land investments. But, such measures are limited to private interests and do not reflect the environmental vulnerability or harm the land may face. Vulnerability indices are useful measures of potential

environmental impacts and provide a needed link between soil characteristics and water quality. All these measures can provide policymakers and natural resource managers with information for beginning to design and target policies for resource management. But, as we broaden our understanding of land as a fundamental base for the environment, broader measures are needed to capture the multiple dimensions of soil and land quality.

Comprehensive Measures of Quality

Instead of focusing on the capability to support specific activities, such as crop production, or a single soil degradation process, such as erosion or chemical leaching, researchers are focusing on how a broad range of physical, chemical, and biological properties determine soil quality. Physical properties include soil tilth, and wind and water erosion; chemical properties include pH, total plant nutrients, and salinity; and biological properties include microbial and natural processes of respiration, mineralization, and denitrification. How do human activities, such as farming, affect the soil and its ability to function in the long run? Eventually, economic analysis could provide estimates of the on- and off-farm costs of soil degradation and the cost of maintaining soil quality.

Most definitions of soil quality include both environmental factors and measures of crop productivity. For example, soil quality has been defined as *the ability of a soil to produce safe and nutritious crops in a sustained manner over the long–term and to enhance human and animal health without impairing the natural resources base or harming the environment* (Parr and others, 1992). Similarly, soil quality can be defined as the *sustaining capacity of a soil to accept, store, and recycle water, minerals, and energy for production of crops at optimum levels while preserving a healthy environment* (Arshad and Coen, 1992). A National Academy of Sciences (NAS, 1993) report defines soil quality as *the ability of a soil to perform its three primary functions: to function as a primary input to crop production; to partition and regulate water flow, and to act as an environmental filter*. In addition, the NAS report recommends that *the concept of soil quality should be the principle guiding the recommendations for use of conservation practices and the targeting of programs and resources.* Currently, conservation compliance plans rely primarily on one soil quality indicator—soil erosion potential as measured by the EI.

A soil's quality is determined by many properties such as soil depth, water-holding capacity, bulk density, nutrient availability, potential capacity, organic matter, microbial biomass, carbon and nitrogen content, soil structure, water infiltration, and crop yield. Because of the correlation across these properties, a few key attributes can be selected as soil quality indicators (Olson, 1992; Hornsby and Brown, 1992; Alexander and McLaughlin, 1992; and Arshad and Coen, 1992). Parr and others (1992) suggest a soil quality index that includes such factors as soil properties, productivity potential, environmental factors, health (human/animal), erodibility, biological diversity, food quality/safety, and management inputs. Many of these factors, such as food quality or biological diversity, are complex indicators themselves but may be important contributors to the full breadth of soil quality. And while the components of soil quality appear quite complex, some soil properties can be estimated without collecting detailed information of attributes. For example, Larson and Stewart (1992) use crop residue data and a simple regression model to estimate changes in soil organic matter for several U.S. soils.

Soil quality is a function of many factors, including agroclimatic factors, hydrogeology, and cropping/production practices. Soil quality can be degraded through three processes: (1) physical degradation such as wind and water erosion and compaction; (2) chemical degradation such as salinization and acidification; and (3) biological degradation, which includes declines in organic matter, carbon from biomass, and the activity and diversity of soil fauna (NAS, 1993).

Physical Degradation. Erosion has long been considered the major agent of soil degradation worldwide (NAS, 1993). Erosion has been shown to reduce onfarm soil productivity and contribute to water quality problems as eroded soils carry agrichemicals and byproducts or residuals into waterways. Another form of soil degradation is compaction, typically caused by heavy machinery and cattle trampling. Soils with low organic matter are particularly vulnerable. Compaction can make tillage costly, impede emergence of seedlings, and decrease water infiltration, causing higher runoff of rainwater and increasing water erosion (WRI, 1992). Eradat and Voorhees (1990) show that the value of yield losses from compaction in Minnesota, Wisconsin, Iowa, Illinois, Indiana, and Ohio could be as high as $100 million annually.

Chemical Degradation. While salinity problems are often associated with irrigation, salinity problems can also occur in dryland areas where rainfall is insufficient to leach salts from the soil. More than 48 million acres of cropland and pastureland are affected by varying degrees of salinity (USDA, 1989a). Irrigated areas are particularly subject to salinization because irrigation water contains dissolved salts, which become more concentrated in the soil as water is consumed by crops or lost by evaporation (USDA, 1989a). Crops such as corn, soybeans, rice, and some fruits and vegetables, are quite sensitive to salinity—an increase in salinity can lead to a significant yield reduction. Acidification, another chemical degradation process, can occur when bases (such as calcium, magnesium, potassium, and sodium) are leached from the soil. Aluminum toxicity is also often a problem in acid soils. Acidity may be reduced by the application of basic material, such as limestone. Acidic soil conditions can limit plant growth by supplying insufficient calcium or magnesium, altering the decomposition rates of organic matter, and reducing the amount of nitrogen fixed by legumes (NAS, 1993).

Biological Degradation. According to the NAS (1993), biological degradation is *perhaps the most serious form of soil degradation because it affects the life of the soil and because organic matter significantly affects the physical and chemical properties of soils*. Currently, little is known about how agricultural activities change a soil's biological properties, and the potential cost to the food and fiber system.

It has been estimated that the number of bacterial species in a gram of soil may exceed 10,000 (Torsvik and others, 1990). Probably less than 1 percent of all bacterial species are presently known and there may be up to 1 million different species on earth (ASM, 1994). Biological degradation is important because if the soil food web is disrupted, the soil may not be able to cycle nutrients and transform harmful chemicals or substances to nontoxic waste or to combat plant pests and diseases (Mausbach, 1997).

The microbial community is continually adapting to the environment, and can function as indicators of changes in soil quality. Changes probably occur more rapidly in the microbial community than in other soil characteristics. Methods to assess soil microbial status need to be explored as indicators to further define and measure soil quality (Kennedy and Papendick, 1992).

Land Quality and Resource Policy

The Natural Resources Conservation Service has recognized the importance of soil quality and has established the Soil Quality Institute to acquire and develop soil quality technology. In addition, many Federal programs address specific soil quality factors such as wind and water erosion and nutrient loss (see chapter 6). USDA programs are directed at conducting research on the relationship between farming practices and soil quality, developing new technologies and practices that conserve and protect soil resources, providing technical and financial assistance to adopt soil conserving practices, and protecting farmland through land retirement and conservation easements.

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1.4 Farm Real Estate Values, Rents, and Taxes

Farm real estate values and cash rents are important indicators of the financial condition of the farm sector. Farm real estate values are influenced by net returns from agricultural production, capital investment in farm structures, interest rates, government commodity programs, and nonfarm demands for farmland. Values have been on the rise since 1987. By early 1995, the average value of U.S. farm real estate exceeded the previous high set in 1982 before values began to decline. Average value continued to increase through 1995. Cash rents also generally increased during 1995 and 1996.

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Values of farm real estate (farmland and attached buildings and dwellings) are important to landowners, prospective buyers, lenders, tax assessors, agricultural producers, and local governments. Farm real estate is the major asset on the farm sector balance sheet (currently accounting for more than 75 percent of total U.S. farm assets), and its value provides an indicator of the general economic health of the agricultural sector. Farm real estate underlies the financial stability of many farm businesses whose portfolios derive a large proportion of their value from real estate. In addition to being the largest single investment item in a typical farmer's portfolio, farm real estate is the principal source of collateral for farm loans, enabling farm operators to finance the purchase of additional farmland and equipment or to finance current operating expenses. Some 52.5 percent of the total farm sector debt of $155 billion at the end of 1996 was real estate debt—either mortgages for purchase of farmland or short- or intermediate-term debt secured by farmland. Wide swings in farm real estate values alter the equity positions, creditworthiness, and borrowing capacity of those farm operators and landowners who hold large percentages of assets in the form of farmland.

Farm Real Estate Values

The rapid increase in farmland values during the 1970's and early 1980's was followed by a sharp decline during 1982-87, then a slow upward trend beginning in 1987 (fig. 1.4.1). Since 1987, average farmland values in the Nation have rebounded 48.6 percent, from $599 per acre to $890 in January 1996. In real or inflation-adjusted terms (1982 dollars), however, this amounts to only a 10.8-percent gain. It was not until January 1, 1995, that the average nominal value per acre surpassed the record high of $823 set in 1981. But even with continued increases in 1995, the January 1996 average, on a real (or inflation-adjusted) basis, was still 40 percent below the 1981 peak.

U.S. farm real estate values rose 7.0 percent during 1995 (table 1.4.1). This represents an

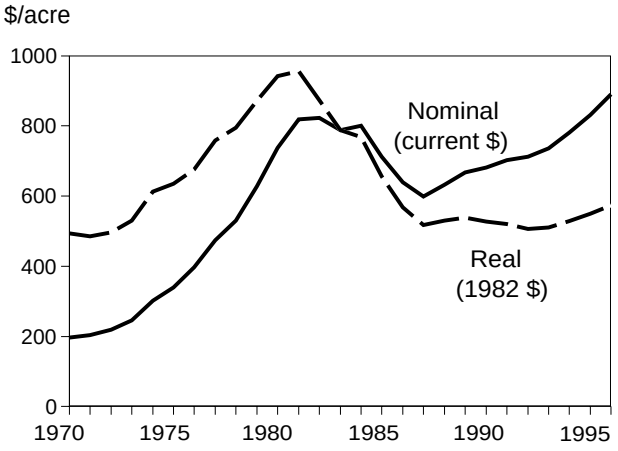
Table 1.4.1—Average per-acre nominal value of farm real estate, by State, January 1, 1989-96[1]

State	1989	1990	1991	1992	1993	1994	1995	1996	Change 1995-96
				Dollars					*Percent*
Northeast	1,825	1,848	1897	1,977	2,095	2,311	2,414	2,485	2.9
Maine	1,046	1,073	1,057	1,033	1,130	1,232	1,245	1,291	3.7
New Hampshire	2,253	2,269	2,194	2,103	2,256	2,459	2,486	2,578	3.7
Vermont	1,226	1,262	1,248	1,223	1,342	1,463	1,479	1,534	3.7
Massachusetts	3,988	4,227	4,301	4,340	4,898	5,339	5,398	5,597	3.7
Rhode Island	5,289	5,564	5,619	5,627	6,304	6,871	6,947	7,204	3.7
Connecticut	4,715	5,033	5,158	5,241	5,959	6,495	6,567	6,810	3.7
New York	1,045	1,014	1,095	1,139	1,237	1,383	1,380	1,333	-3.4
New Jersey	4,947	5,494	6,341	6,710	6,942	7,407	8,052	8,172	1.5
Pennsylvania	1,936	1,929	1,937	2,073	2,056	2,247	2,339	2,505	7.1
Delaware	2,037	2,214	2,181	2,042	2,246	2,511	2,689	2,907	8.1
Maryland	2,534	2,563	2,394	2,530	2,911	3,310	3,707	3,826	3.2
Lake States	820	843	909	920	956	986	1,048	1,126	7.5
Michigan	983	1,005	1,086	1,106	1,131	1,214	1,329	1,470	10.6
Wisconsin	845	801	849	865	925	968	1,065	1,175	10.3
Minnesota	747	810	881	884	910	914	936	976	4.2
Corn Belt	1,108	1,111	1,153	1,190	1,235	1,331	1,448	1,578	9.0
Ohio	1,298	1,273	1,323	1,396	1,456	1,593	1,800	1,989	10.5
Indiana	1,249	1,254	1,291	1,325	1,395	1,504	1,654	1,801	8.9
Illinois	1,391	1,405	1,459	1,536	1,548	1,694	1,863	2,064	10.8
Iowa	1,095	1,090	1,139	1,153	1,212	1,281	1,349	1,442	6.9
Missouri	684	701	723	734	774	825	880	948	7.7
Northern Plains	387	401	403	400	401	432	458	478	4.5
North Dakota	317	321	337	318	335	353	373	383	2.5
South Dakota	273	291	293	286	273	286	302	319	5.5
Nebraska	511	524	517	517	514	562	596	632	6.0
Kansas	429	450	449	460	463	503	535	553	3.3
Appalachian	1,110	1,178	1,154	1,223	1,300	1,336	1,436	1,597	11.2
Virginia	1,397	1,665	1,490	1,643	1,636	1,690	1,771	1,925	8.7
West Virginia	731	664	704	843	849	869	910	965	6.0
North Carolina	1,364	1,355	1,382	1,455	1,573	1,609	1,749	1,970	12.6
Kentucky	910	978	958	988	1,077	1,136	1,250	1,377	10.2
Tennessee	1,037	1,067	1,095	1,130	1,245	1,250	1,336	1,526	14.2
Southeast	1,216	1,300	1,319	1,301	1,345	1,427	1,533	1,631	6.4
South Carolina	990	1,011	1,112	1,152	1,137	1,204	1,337	1,363	2.0
Georgia	1,030	1,079	1,095	1,025	1,131	1,154	1,256	1,358	8.1
Florida	1,880	2,070	2,110	2,033	2,037	2,165	2,219	2,306	3.9
Alabama	847	890	864	936	1,000	1,117	1,262	1,387	9.9
Delta States	809	806	834	820	866	912	972	1,009	3.8
Mississippi	717	736	766	754	777	836	886	917	3.5
Arkansas	801	796	841	815	880	927	983	989	0.6
Louisiana	959	925	920	926	972	1,000	1,082	1,176	8.7
Southern Plains	520	504	494	487	498	521	550	562	2.2
Oklahoma	518	491	477	482	496	517	547	547	0.0
Texas	521	507	498	488	499	522	550	566	2.9
Mountain	259	265	283	283	290	319	346	379	9.8
Montana	202	222	219	219	227	254	277	289	4.5
Idaho	593	658	654	680	682	774	836	905	8.3
Wyoming	144	153	159	145	159	180	192	206	7.3
Colorado	375	374	437	400	426	479	520	558	7.3
New Mexico	185	185	210	212	194	208	225	258	15.0
Arizona	276	267	291	311	316	325	347	399	15.0
Utah	426	398	417	445	491	537	606	697	15.0
Nevada	242	207	241	262	252	268	289	332	15.0
Pacific	1,175	1,259	1,362	1,410	1,453	1,510	1,549	1,675	8.2
Washington	777	821	864	880	892	1,025	1,065	1,117	4.9
Oregon	536	573	586	607	663	747	844	928	9.9
California	1,742	1,884	2,077	2,157	2,213	2,213	2,215	2,404	8.5
48 States	668	682	703	713	736	782	832	890	7.0

[1] Value of farmland and buildings in nominal dollars

Source: USDA, ERS, based on Agricultual Land Value Survey, June Agricultural Survey; and 1992 Census of Agriculture data.

Figure 1.4.1--Average real and nominal values of U. S. farm real estate, 1970-96

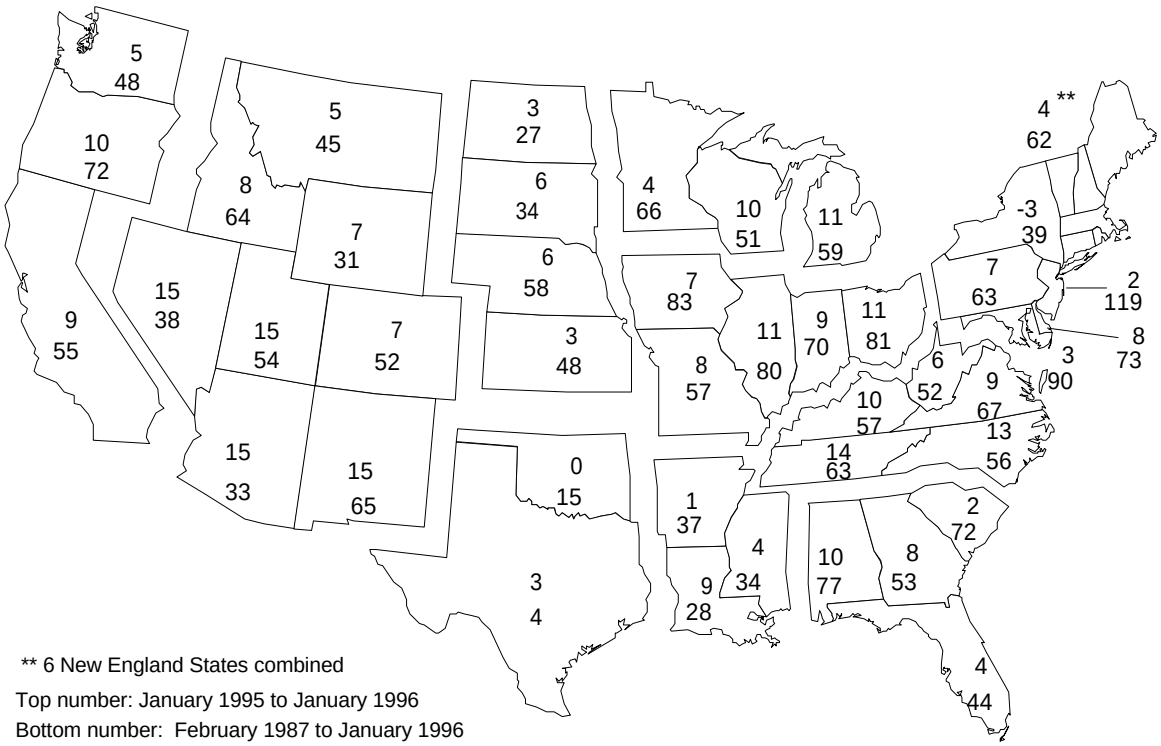


Source: USDA, ERS

inflation-adjusted increase of 4.4 percent (table 1.4.2). All States recorded increases except New York and Oklahoma. Several States in the Lake States, Corn Belt, Appalachian, and Mountain regions recorded double-digit increases in farm real estate values. The largest regional increases occurred in the Applachian, Mountain, and Corn Belt regions (11.2, 9.8, and 9 percent).

The 1995 increase was the strongest yearly gain since 1987. The 7.0-percent nominal increase during 1995 marked the 9th consecutive yearly increase since 1987. The largest State-by-State increases over the 1987-95 period occurred in several of the Northeast States, where most States never experienced the sharp declines in farm real estate value that characterized most other States during the early- to mid-1980's (fig. 1.4.2). Much of this increase can be attributed to strong nonfarm demand for farmland associated with population growth. Another set of relatively high increases since 1987 occurred in the Corn Belt, the region that also experienced the largest value declines between 1981 and 1986. The relatively small increase in Texas is largely a product of the beginning and end points of the time period being discussed. Texas farm real estate values continued to increase until the mid-1980's, before declining and then beginning a slow recovery later than most other States. The counter-cyclical pattern is partially attributable to changing conditions in the oil industry during the 1980's.

Figure 1.4.2--Percent change in farm real estate value per acre (nominal dollars), 1987-96 and 1995-96



** 6 New England States combined

Top number: January 1995 to January 1996

Bottom number: February 1987 to January 1996

Source: USDA, ERS.

Table 1.4.2—Average per-acre real (inflation-adjusted) value of farm real estate, by State, Jan. 1, 1989-96[1]

State	1989	1990	1991	1992	1993	1994	1995	1996	Change 1995-96
				1982 dollars					*Percent*
Northeast	1,473	1,430	1,408	1,410	1,454	1,563	1,596	1,603	0.6
Maine	844	830	783	736	784	833	823	833	1.1
New Hampshire	1,817	1,754	1,626	1,497	1,566	1,663	1,644	1,663	1.2
Vermont	989	976	925	871	931	989	978	990	1.2
Massachusetts	3,217	3,268	3,188	3,090	3,399	3,611	3,569	3,610	1.2
Rhode Island	4,266	4,302	4,165	4,007	4,375	4,648	4,593	4,647	1.2
Connecticut	3,803	3,891	3,823	3,732	4,135	4,393	4,342	4,393	1.2
New York	843	784	812	811	858	935	913	860	-5.8
New Jersey	3,990	4,247	4,700	4,778	4,818	5,010	5,324	5,271	-1.0
Pennsylvania	1,562	1,491	1,436	1,476	1,427	1,520	1,547	1,616	4.5
Delaware	1,643	1,712	1,617	1,454	1,559	1,698	1,778	1,875	5.5
Maryland	2,044	1,981	1,774	1,801	2,020	2,239	2,451	2,468	0.7
Lake States	662	652	674	655	663	667	693	726	4.8
Michigan	793	777	805	788	785	821	879	948	7.9
Wisconsin	682	619	629	616	642	655	704	758	7.6
Minnesota	603	626	653	629	632	618	619	630	1.7
Corn Belt	894	859	855	848	857	901	957	1,018	6.3
Ohio	1,047	984	981	994	1,010	1,077	1,190	1,283	7.8
Indiana	1,007	969	957	943	968	1,017	1,094	1,162	6.2
Illinois	1,122	1,086	1,081	1,094	1,074	1,145	1,232	1,331	8.1
Iowa	883	843	844	821	841	867	892	930	4.3
Missouri	552	542	536	523	537	558	582	612	5.1
Northern Plains	312	310	299	285	278	292	303	308	1.8
North Dakota	256	248	250	226	232	239	247	247	0.1
South Dakota	220	225	217	204	189	194	200	206	2.9
Nebraska	412	405	383	368	357	380	394	408	3.5
Kansas	346	348	333	328	321	340	354	357	0.8
Appalachian	895	910	855	870	902	904	949	1,030	8.5
Virginia	1,127	1,287	1,104	1,170	1,135	1,143	1,171	1,242	6.0
West Virginia	590	513	522	600	589	588	602	622	3.4
North Carolina	1,100	1,048	1,024	1,036	1,092	1,088	1,157	1,271	9.9
Kentucky	734	756	710	703	747	769	826	888	7.5
Tennessee	836	825	812	805	864	845	884	984	11.4
Southeast	980	1,005	978	926	934	965	1,014	1,052	3.8
South Carolina	799	782	824	820	789	814	884	879	-0.5
Georgia	831	834	812	730	785	780	830	876	5.5
Florida	1,516	1,600	1,564	1,448	1,414	1,465	1,467	1,488	1.4
Alabama	683	688	640	666	694	756	834	895	7.2
Delta States	653	623	618	584	601	617	643	651	1.3
Mississippi	578	569	568	537	539	566	586	592	0.9
Arkansas	646	615	623	580	611	627	650	638	-1.9
Louisiana	774	715	682	659	675	677	716	759	6.0
Southern Plains	420	389	366	347	346	353	363	363	-0.2
Oklahoma	418	380	354	343	344	350	362	353	-2.5
Texas	420	392	369	347	346	353	364	365	0.4
Mountain	209	205	210	202	201	216	229	244	6.9
Montana	163	172	162	156	158	172	183	186	1.8
Idaho	478	509	485	484	473	524	553	584	5.6
Wyoming	116	118	118	103	110	121	127	133	4.8
Colorado	302	289	324	285	296	324	344	360	4.7
New Mexico	149	143	156	151	135	141	149	166	11.9
Arizona	223	206	216	221	219	220	229	257	12.2
Utah	344	308	309	317	341	363	401	450	12.2
Nevada	195	160	179	187	175	181	191	214	12.1
Pacific	948	974	1,008	1,001	1,008	1,021	1,024	1,080	5.5
Washington	627	635	640	627	619	693	704	721	2.3
Oregon	432	443	434	432	460	505	558	599	7.3
California	1,405	1,457	1,540	1,536	1,536	1,497	1,465	1,551	5.9
48 States	539	528	521	507	511	529	550	574	4.4

[1] Nominal values as of Jan. 1 for farmland and buildings adjusted by the Gross Domestic Product implicit price deflator indexed to 1982 = 100.
Source: USDA, ERS, based on Agricultural Land Value Survey, June Agricultural Survey; and 1992 Census of Agriculture data.

In 1996, California, Florida, and the Northeast States continued to record the highest average per-acre values for farm real estate. Farm real estate values in the Northeast reflect continued pressure from nonagricultural sources for conversion to residential or other urban use. The relatively high values in California and Florida are the consequence of both urban pressures and the presence of intensive agriculture for the production of high-valued crops. Alternatively, the low average values in the Mountain States can be attributed to large amounts of arid rangeland and less productive cropland. Wyoming, New Mexico, and Montana recorded the lowest average per-acre values (table 1.4.1).

Variation among States in the 1995 rate of increase in value can be attributed to several factors. For the Mountain States, growing recreational use of rural land and population pressures related to urbanization appear to be the driving forces behind value gains. The Mountain region experienced the largest population growth of any region from 1990 to 1993 (8.2 percent) (U.S. Dept. Of Commerce, 1995) and contained six of the ten fastest-growing States. The increasing farmland values in the Corn Belt during 1995 can be attributed to increased net returns from corn and soybeans, the major agricultural products of the region, as well as continued improvements in yields.

As of January 1, 1996, the total value of U.S. farm real estate reached $860 billion, while the average per-farm value (total value divided by the number of farms) was $417,761 (tables 1.4.3 and 1.4.4). By State, the total value of farm real estate was greatest for California, Texas, and Illinois, and lowest for several of the New England States. State-level averages ranged from $178,497 per farm in West Virginia to $1,883,308 in Arizona. Variation among States in the per-farm average results from differences in per-acre values and differences in average size of operation. West Virginia farms averaged 185 acres per operation, compared with 4,780 acres in Arizona. These per-farm values are more appropriate as indicators of the value of land resources associated with typical farm operations than as indicators of the equity or wealth of typical individual farm operators. The land resource assets of most farm operations have multiple owners. Many operations lease significant proportions of the land they operate, others are organized as partnerships or corporations, and many operations use owned land as loan collateral, thus giving lenders an implicit interest in the land asset.

Cash Rents

A substantial proportion of U.S. farmland is operated under some form of lease, approximately 43 percent in 1992, according to the 1992 Census of Agriculture. The most common form of lease, the cash rental agreement, is characterized by a fixed payment negotiated before planting, whereas in share rental agreements, payment to the landowner varies with the amount of product harvested. Under cash rental arrangements, the tenant bears all of the production and market-price risk; share rental arrangements implicitly divide production and market risks between tenant and landlord.

The term “cash rent” refers to the amount of cash paid by a tenant to a landowner for use of a farmland parcel as an input in agricultural production. Cash rents are generally considered a shortrun indicator of the return to a landowner’s investment in the land, though to tenants, cash rents represent a major production expense. Because rents reflect the income-earning capacity of the land, they vary widely across the country. Cropland rents tend to be highest in States and regions where higher-value crops are grown. During 1996, the highest average rents were reported for irrigated land in California at $210 per acre (table 1.4.5). California produces large shares of high-value specialty crops, vegetables, fruits, and nuts. Cropland suitable for corn and soybean production in the Midwest also commands high rents. The highest rents for nonirrigated cropland in 1996 were reported in Illinois ($106 per acre) and Iowa ($105 per acre).

Average cash rents for cropland were higher in most States for the 1996 crop year than in 1995. This pattern was roughly similar for both irrigated and nonirrigated cropland. An upward pattern was evident in most regions.

During 1996, average cash rents for pasture varied from $40 per acre in Wisconsin to $5.40 per acre in Texas, but for many States, survey data were insufficient to make an estimate (table 1.4.6). Average cash rents for pasture were almost uniformly lower than in 1995 in the Northern Plains, Appalachian, Southeast, Delta, and Southern Plains. For the Corn Belt, Mountain, and Southeast regions, some States reported higher cash rents compared with 1995.

Table 1.4.3—Total value of farmland and buildings, by State, 1989-96[1]

State	1989	1990	1991	1992	1993	1994	1995	1996
				Million dollars				
Northeast	45,461	45,598	46,551	47,978	50,248	54,511	55,983	57,240
Maine	1,517	1,556	1,501	1,467	1,582	1,675	1,681	1,730
New Hampshire	1,036	998	965	925	993	1,082	1,094	1,109
Vermont	1,778	1,817	1,785	1,749	1,919	2,048	2,026	2,070
Massachusetts	2,592	2,705	2,710	2,734	2,988	3,203	3,077	3,190
Rhode Island	386	389	371	355	397	433	438	454
Connecticut	2,075	2,114	2,166	2,149	2,384	2,533	2,495	2,588
New York	8,778	8,518	9,089	9,340	10,020	10,925	10,628	10,266
New Jersey	4,353	4,780	5,580	5,905	6,040	6,370	6,844	6,865
Pennsylvania	15,875	15,625	15,690	16,584	16,242	17,528	18,013	19,292
Delaware	1,243	1,328	1,309	1,205	1,280	1,431	1,533	1,643
Maryland	5,828	5,767	5,387	5,566	6,404	7,282	8,155	8,034
Lake States	47,898	49,252	53,016	53,256	54,946	56,487	60,130	64,399
Michigan	10,616	10,854	11,729	11,948	12,102	12,985	14,219	15,579
Wisconsin	14,872	14,098	14,858	14,965	15,818	16,367	18,004	19,741
Minnesota	22,410	24,300	26,430	26,343	27,027	27,135	27,907	29,079
Corn Belt	137,982	138,026	142,588	146,624	151,684	163,227	177,204	192,996
Ohio	20,379	19,859	20,507	21,359	22,131	24,212	27,359	30,033
Indiana	20,484	20,440	20,656	21,200	22,320	24,061	26,302	28,642
Illinois	39,644	39,902	41,290	43,315	43,499	47,588	52,346	58,000
Iowa	36,683	36,515	38,157	38,510	40,360	42,532	44,786	47,876
Missouri	20,794	21,310	21,979	22,240	23,375	24,835	26,411	28,445
Northern Plains	69,550	72,127	72,423	71,827	71,941	77,456	81,994	85,567
North Dakota	12,839	13,001	13,615	12,847	13,534	14,278	15,041	15,417
South Dakota	12,094	12,891	12,951	12,641	12,067	12,658	13,306	14,038
Nebraska	24,068	24,680	24,351	24,351	24,209	26,485	28,074	29,695
Kansas	20,549	21,555	21,507	21,988	22,131	24,035	25,573	26,417
Appalachian	54,595	57,119	55,741	58,840	62,247	63,737	68,225	75,536
Virginia	12,573	14,819	13,112	14,294	14,070	14,534	15,232	16,557
West Virginia	2,705	2,457	2,605	3,119	3,141	3,217	3,368	3,570
North Carolina	13,640	13,144	13,267	13,823	14,786	14,965	16,092	18,120
Kentucky	12,922	13,790	13,508	13,931	15,186	16,021	17,498	19,283
Tennessee	12,755	12,911	13,250	13,673	15,065	15,000	16,035	18,006
Southeast	48,259	50,297	49,741	48,912	50,522	53,796	57,560	60,188
South Carolina	5,247	5,257	5,782	5,990	5,856	6,141	6,749	6,816
Georgia	12,978	13,488	13,250	12,403	13,685	13,959	15,076	16,025
Florida	21,056	22,563	22,155	21,347	20,981	22,303	22,860	23,752
Alabama	8,978	8,989	8,554	9,173	10,000	11,393	12,875	13,594
Delta	30,839	30,139	30,936	30,177	31,769	33,095	35,378	36,627
Mississippi	9,536	9,568	9,805	9,651	9,946	10,701	11,432	11,557
Arkansas	12,576	12,338	13,036	12,470	13,464	13,992	14,747	14,836
Louisiana	8,727	8,233	8,096	8,056	8,359	8,402	9,199	10,234
Southern Plains	85,866	83,127	80,979	79,828	81,734	84,969	89,578	90,503
Oklahoma	17,094	16,203	15,741	16,388	16,864	17,572	18,609	18,609
Texas	68,772	66,924	65,238	63,440	64,870	67,396	70,968	71,894
Mountain	63,075	64,372	68,463	68,259	69,791	76,501	82,908	90,773
Montana	12,241	13,431	13,206	13,140	13,575	15,165	16,529	17,273
Idaho	8,124	9,015	8,829	9,180	9,207	10,450	11,286	12,223
Wyoming	5,011	5,309	5,517	5,017	5,501	6,211	6,633	7,118
Colorado	12,563	12,379	14,334	13,120	13,973	15,658	17,020	18,150
New Mexico	8,233	8,233	9,303	9,370	8,575	9,184	9,883	11,287
Arizona	9,936	9,665	10,418	11,072	11,218	11,522	12,282	14,125
Utah	4,814	4,497	4,712	5,029	5,499	5,957	6,731	7,671
Nevada	2,154	1,842	2,145	2,332	2,243	2,355	2,543	2,925
Pacific	76,497	81,363	87,603	89,844	92,265	95,438	98,057	105,882
Washington	12,432	13,136	13,824	14,080	14,272	16,194	16,825	17,538
Oregon	9,541	10,199	10,431	10,623	11,603	13,076	14,776	16,239
California	54,525	58,027	63,349	65,141	66,390	66,169	66,456	72,105
48 States	660,022	671,419	688,042	695,545	717,147	759,217	807,017	859,711

[1] Value data as of Feb. 1, 1989, and Jan. 1 for 1990-96.

Source: USDA, ERS, based on Agricultural Land Value Survey, June Agricultural Survey; and 1992 Census of Agriculture data.

Table 1.4.4—Average per-farm value of farmland and buildings, by State, 1989-96[1]

State	1989	1990	1991	1992	1993	1994	1995	1996
				Dollars				
Northeast	307,024	314,162	321,043	331,340	354,360	390,480	405,088	415,086
Maine	207,767	216,090	211,400	200,940	216,712	220,409	221,195	233,834
New Hampshire	345,460	369,763	357,541	342,711	397,056	450,824	475,600	461,905
Vermont	269,348	279,582	278,850	273,264	299,853	330,305	337,675	345,057
Massachusetts	398,800	422,700	423,380	427,219	481,900	533,882	512,767	514,586
Rhode Island	501,425	526,324	529,791	506,430	567,360	618,422	625,225	648,358
Connecticut	518,650	542,015	555,477	537,203	627,263	666,624	656,676	680,973
New York	225,077	221,236	239,171	245,784	267,192	303,484	295,209	285,172
New Jersey	524,501	590,096	656,480	656,089	678,600	715,744	760,423	746,167
Pennsylvania	293,985	294,809	296,032	318,923	318,478	343,691	360,259	385,837
Delaware	414,190	458,069	451,241	446,215	512,088	572,514	613,163	657,015
Maryland	373,603	379,391	349,773	356,795	426,947	502,178	570,305	586,407
Lake States	211,940	220,859	239,893	240,977	252,047	261,516	272,081	294,059
Michigan	193,025	201,000	217,200	221,262	232,725	249,714	263,309	293,942
Wisconsin	183,605	176,220	188,070	189,424	200,222	207,180	225,049	249,884
Minnesota	249,000	273,034	300,341	299,355	310,655	319,237	320,772	334,244
Corn Belt	302,592	309,476	326,288	337,844	356,067	387,713	423,934	470,722
Ohio	239,748	239,263	256,331	273,831	291,200	322,820	369,717	417,123
Indiana	288,501	300,591	317,785	326,154	354,286	381,920	424,220	477,375
Illinois	460,971	480,747	503,533	534,756	550,618	618,022	679,824	763,156
Iowa	349,357	351,106	370,451	373,885	395,682	421,109	447,862	488,535
Missouri	190,767	197,319	205,413	207,852	220,517	236,524	251,533	273,506
Northern Plains	357,581	370,834	375,250	376,058	384,713	416,430	438,470	461,278
North Dakota	383,239	388,075	412,570	389,309	416,431	446,199	470,020	497,311
South Dakota	345,540	368,323	370,017	361,177	349,757	372,290	403,219	431,940
Nebraska	422,247	432,989	434,834	434,834	440,171	481,547	501,325	530,276
Kansas	297,813	312,391	311,697	328,179	340,483	369,765	387,469	400,255
Appalachian	172,223	185,152	185,187	195,480	208,185	215,326	231,270	256,925
Virginia	267,511	322,141	291,378	317,647	312,658	315,954	324,075	344,931
West Virginia	128,795	119,844	130,240	155,955	157,065	160,835	168,394	178,497
North Carolina	209,846	211,992	221,120	230,375	250,614	258,024	277,456	312,415
Kentucky	136,021	148,277	148,437	153,086	166,876	180,010	196,607	219,123
Tennessee	143,316	148,399	155,876	160,859	179,339	180,720	197,960	225,081
Southeast	298,819	312,402	317,831	314,548	325,947	351,607	376,209	402,593
South Carolina	205,765	210,288	236,016	244,506	243,981	266,992	306,795	317,038
Georgia	270,375	280,990	288,033	269,620	297,502	310,196	335,011	372,675
Florida	513,561	550,317	553,875	547,346	537,977	571,869	586,166	593,801
Alabama	191,026	191,255	185,948	199,409	217,391	247,683	273,926	302,095
Delta	250,721	253,265	266,692	267,052	281,140	298,156	315,878	321,293
Mississippi	232,588	239,200	245,120	247,467	255,015	274,397	272,195	262,662
Arkansas	261,994	262,511	283,380	277,100	299,200	318,006	342,965	345,022
Louisiana	256,674	257,266	269,867	277,800	288,248	300,056	340,694	379,048
Southern Plains	325,250	312,508	303,292	296,758	302,159	314,699	328,123	326,727
Oklahoma	244,200	231,471	224,871	230,817	239,206	251,033	262,099	258,459
Texas	354,495	341,449	331,157	320,404	324,350	336,982	351,329	350,704
Mountain	524,751	541,394	580,198	584,913	605,296	672,239	724,091	792,774
Montana	495,595	543,765	534,644	540,741	570,361	673,981	751,336	785,146
Idaho	367,606	413,514	412,570	437,143	449,122	509,753	524,927	555,576
Wyoming	563,056	596,528	613,033	545,326	597,978	675,117	721,025	782,162
Colorado	465,278	467,147	551,292	514,510	547,953	618,875	680,790	740,837
New Mexico	588,036	609,815	689,111	694,104	635,170	680,267	732,042	836,108
Arizona	1,242,000	1,239,154	1,370,763	1,476,213	1,515,946	1,557,026	1,659,790	1,883,308
Utah	370,292	340,712	354,293	380,947	423,015	458,228	502,341	572,487
Nevada	861,520	736,920	857,960	932,720	934,500	981,288	1,017,399	1,170,009
Pacific	481,116	513,329	557,983	574,082	605,013	623,780	634,676	676,560
Washington	327,158	355,027	373,622	380,541	396,444	449,821	467,364	487,162
Oregon	257,859	279,436	281,914	283,267	309,400	344,106	383,790	421,785
California	649,102	682,673	763,235	794,407	840,380	837,578	830,705	879,332
48 States	304,260	313,668	325,855	330,818	345,098	368,659	390,581	417,761

[1] Value data as of Feb. 1, 1989, and Jan. 1, for 1990-96. Average per-farm value is estimated by dividing total value of farm real estate by the number of farms.

Source: USDA, ERS, based on Agricultural Land Value Survey, June Agricultural Survey; and 1992 Census of Agriculture data.

Table 1.4.5—Cropland rented for cash: average gross cash rent per acre and rent as a percent of value, selected States, 1992-96

State and land type[2]		Rent per acre						Rent to value[1]					
		ALVS[3] 1992	ALVS 1993	ALVS 1994	JAS[4] 1994	ALVS 1995	JAS 1996	ALVS 1992	ALVS 1993	ALVS 1994	JAS 1994	JAS 1995	JAS 1996
		Dollars						*Percent*					
Northeast:													
New England[5]		na	na	na	31.50	35.20	30.70	na	na	na	.7	.7	1.0
New York		36.20	34.90	38.20	25.10	25.10	29.00	4.5	3.9	3.8	2.4	2.2	2.9
New Jersey		52.00	50.60	71.10	42.90	45.40	44.80	0.5	0.8	1.3	0.4	0.6	.4
Pennsylvania		42.40	44.10	41.90	37.70	38.80	38.50	1.8	2.0	1.5	1.4	1.5	1.3
Delaware		62.30	57.90	59.80	54.90	61.10	64.30	3.3	2.6	2.8	2.4	2.5	2.7
Maryland		*	55.40	60.80	41.40	44.70	48.00	*	2.3	2.2	1.3	1.6	1.6
Lake States:													
Michigan		47.40	45.60	49.00	48.00	49.70	52.20	6.2	5.7	5.5	4.8	4.9	4.3
Wisconsin		51.40	52.50	51.20	48.70	46.20	48.50	7.3	6.9	6.8	5.6	4.9	4.6
Minnesota		62.30	64.20	61.90	66.00	70.10	73.80	7.6	7.6	7.9	6.8	6.5	6.4
Corn Belt:													
Ohio		70.20	68.50	70.50	64.50	67.10	70.80	5.6	5.5	4.7	3.8	3.5	2.7
Indiana		85.70	88.30	90.40	83.40	88.40	94.80	7.5	6.8	6.3	5.7	5.6	5.2
Illinois		103.30	102.90	107.30	99.50	99.70	106.00	6.5	6.3	5.5	4.2	4.9	4.6
Iowa		104.60	108.00	107.00	98.60	99.60	105.00	8.0	7.9	7.4	6.5	6.3	5.8
Missouri	-All cropland	58.20	64.10	64.80	na	na	na	8.0	8.9	8.6	na	na	na
	-Nonirrigated	na	na	na	55.10	51.10	47.10	na	na	na	4.2	4.2	3.8
Northern Plains:													
N. Dakota		29.10	31.30	31.90	32.90	33.10	34.00	8.7	8.5	8.2	7.0	7.1	7.2
S. Dakota	-All cropland	30.40	30.50	32.20	na	na	na	8.3	8.0	8.2	na	na	na
	-Nonirrigated	na	na	na	30.00	30.20	31.90	na	na	na	6.6	6.9	6.9
Nebraska	-Nonirrigated	49.60	50.30	50.30	56.70	57.20	63.00	8.6	8.6	8.3	8.2	7.7	6.5
	-Irrigated	102.80	102.20	106.80	108.40	111.10	112.00	9.5	9.3	9.3	8.5	8.4	7.5
Kansas	-Nonirrigated	31.90	32.80	34.70	32.60	35.50	32.70	7.2	7.4	7.3	6.5	5.9	5.8
	-Irrigated	62.70	65.10	72.50	*	*		9.5	9.3	10.1	*	*	*
Appalachian:													
Virginia		34.40	33.80	37.40	35.80	35.70	37.70	2.1	2.4	2.4	2.2	1.9	2.0
West Virginia		30.40	30.10	36.90	31.00	30.00	32.00	3.4	3.5	4.3	2.7	2.3	2.1
North Carolina		37.70	41.00	38.10	32.50	33.60	39.00	2.8	2.8	2.5	2.2	2.0	2.2
Kentucky		52.60	55.30	59.00	49.10	52.80	64.00	5.4	5.2	5.7	4.4	3.8	4.9
Tennessee		48.80	50.20	49.50	46.70	43.00	48.30	5.1	4.8	5.8	3.6	3.1	3.0
Southeast:													
S. Carolina		21.70	22.50	23.40	23.90	23.50	23.80	2.5	2.8	2.6	2.6	2.5	2.5
Georgia	-All cropland	29.70	30.50	32.00	na	na	na	3.5	3.2	3.5	na	na	na
	-Nonirrigated	na	na	na	28.70	32.90	36.40	na	na	na	3.9	4.2	4.4
	-Irrigated	na	na	na	56.10	60.80	66.90	na	na	na	5.3	6.1	5.2
Florida	-All cropland	101.50	95.70	73.10	na	na	na	3.0	3.5	1.9	na	na	na
	-Nonirrigated	na	na	na	20.80	22.50	30.00	na	na	na	2.0	2.8	2.8
	-Irrigated	na	na	na	136.30	183.50	na	na	na	na	1.8	1.7	*
Alabama		28.10	30.70	36.50	31.60	36.20	42.20	4.1	4.3	4.8	2.8	3.4	4.0
Delta States:													
Mississippi	-All cropland	40.80	39.60	44.00	na	na	na	6.7	6.4	6.7	na	na	na
	-Nonirrigated	na	na	na	44.30	41.60	45.00	na	na	na	5.7	5.5	5.4
	-Irrigated	na	na	na	59.90	70.00	73.70	na	na	na	6.6	7.3	7.9
Arkansas	-All cropland	48.00	50.10	50.70	na	na	na	7.3	7.2	6.3	na	na	na
	-Nonirrigated	na	na	na	46.90	48.40	48.80	na	na	na	6.5	6.8	5.6
	-Irrigated	na	na	na	68.10	58.70	*	na	na	na	6.8	6.4	*
Louisiana	-All land	48.30	46.80	48.30	na	na	na	6.1	5.6	6.0	na	na	na
	-Nonirrigated	na	na	na	47.90	55.30	55.60	na	na	na	5.9	5.7	5.7
	-Irrigated	na	na	na	78.90	77.60	65.30	na	na	na	8.9	8.2	6.9
Southern Plains:													
Oklahoma	-Nonirrigated	26.10	26.20	25.20	25.50	25.10	25.60	5.6	5.5	5.1	4.5	4.0	4.7
	-Irrigated	39.10	39.10	41.70	*	*	*	5.9	6.4	6.9	*	*	*
Texas	-Nonirrigated	20.00	20.60	20.20	17.60	17.00	18.00	3.3	3.5	3.2	2.6	2.1	2.1
	-Irrigated	45.30	49.40	44.90	58.50	53.80	44.80	7.3	7.6	6.3	5.7	5.6	4.6

Continued--

Table 1.4.5—Cropland rented for cash: average gross cash rent per acre and rent as a percent of value, selected States, 1992-96—continued

State and land type[2]		Rent per acre						Rent to value[1]					
		ALVS[3] 1992	ALVS 1993	ALVS 1994	JAS[4] 1994	JAS 1995	JAS 1996	ALVS 1992	ALVS 1993	ALVS 1994	JAS 1994	JAS 1995	JAS 1996
		Dollars						*Percent*					
Mountain:													
Montana	-Nonirrigated	19.80	21.00	24.10	15.20	15.30	19.0	8.3	7.8	8.4	5.1	5.1	5.3
	-Irrigated	50.60	54.80	49.70	*	*	*	5.0	5.5	7.3	*	*	*
Idaho	-Nonirrigated	33.90	34.30	47.80	*	*	44.10	5.6	6.4	7.6	*	*	6.5
	-Irrigated	114.30	100.50	126.60	99.50	112.30	113.00	9.9	7.1	8.9	6.9	7.4	6.6
Wyoming	-Nonirrigated	9.60	13.40	16.10	*	*	*	5.7	6.7	6.3	*	*	*
	-Irrigated	49.40	54.00	51.20	*	*	*	8.7	8.2	7.7	*	*	*
Colorado	-Nonirrigated	20.40	24.80	28.80	*	*	*	5.6	7.6	8.8	*	*	*
	-Irrigated	72.70	76.20	75.50	*	*	*	7.2	7.1	7.8	*	*	*
New Mexico	-Irrigated	87.70	80.40	88.90	77.70	88.00	*	2.6	2.5	1.8	4.2	4.6	*
Arizona	-All land	na	na	na	80.60	87.40	94.60	na	na	na	3.0	2.8	2.2
	-Irrigated	128.10	136.70	150.10	na	na	na	3.8	3.6	3.0	na	na	na
Utah	-Nonirrigated	30.50	26.30	28.20	*	*	*	3.8	3.3	3.6	*	*	*
	-Irrigated	57.60	52.90	54.00	51.40	50.90	60.00	3.4	3.0	2.5	1.5	1.4	1.4
Nevada	-Irrigated	92.70	89.10	81.70	*	*	*	4.8	6.2	3.2	*	*	*
Pacific:													
Washington	-Nonirrigated	49.80	53.40	55.90	69.50	70.80	*	5.5	5.4	6.7	4.1	4.6	*
	-Irrigated	113.10	124.20	133.20	127.90	137.80	138.00	5.7	6.3	6.1	6.5	7.1	4.6
Oregon	-Nonirrigated	58.20	55.50	61.90	59.10	66.00	65.80	6.0	5.6	4.2	4.2	4.6	3.7
	-Irrigated	106.70	124.70	135.90	125.50	130.00	115.00	6.1	7.8	7.4	5.2	5.8	4.9
California	-Irrigated	179.60	191.50	223.00	176.00	189.60	210.00	3.4	3.6	4.4	4.4	4.6	3.6

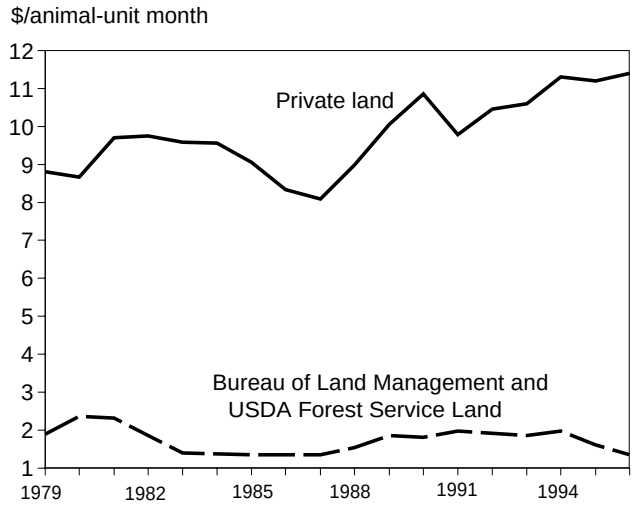
* = Insufficient information; na = data not available.
[1] Cash rent as a percent of per acre value of rented cropland.
[2] Unless otherwise specified as irrigated or nonirrigated, data are for all cropland.
[3] ALVS is "Agricultural Land Values Survey."
[4] JAS is "June Agricultural Survey."
[5] Combines 6 States.
Source: USDA, ERS, based on ALVS and JAS data.

Grazing Fees

Grazing fees for use of pasture or rangeland are also a form of cash rent, except that payment is based on "grazing units" rather than tracts of land (acres). A grazing unit is defined on an animal-unit-month (AUM) basis, which is one cow (or an equivalent in terms of other livestock types) for 1 month. Grazing fees on privately owned nonirrigated land in 16 selected States averaged $11.40 per AUM in 1996, a 1.8-percent increase over 1995 (table 1.4.7). Fees ranged from $18 per AUM in Nebraska to $6.50 in Arizona. Private grazing fees have been relatively stable over the last decade (fig. 1.4.3).

Grazing fees on public lands administered by the Bureau of Land Management (BLM) of the Department of the Interior, and the Forest Service (FS) of the Department of Agriculture are set by law. The fees vary annually according to a legislated formula, which attempts to set the fees according to changes in the cost of production. As a result of the

Figure 1.4.3--Average grazing fees on private and public lands, 1979-96



Sources: USDA, ERS, based on NASS and USDI data.

Table 1.4.6—Pasture rented for cash: average gross cash rent per acre and rent as a percent of value, selected States, 1992-96

State	Rent per acre						Rent to value[1]					
	ALVS[2] 1992	ALVS 1993	ALVS 1994	JAS[3] 1994	JAS 1995	JAS 1996	ALVS 1992	ALVS 1993	ALVS 1994	JAS 1994	JAS 1995	JAS 1996
	Dollars						*Percent*					
Northeast:												
New England[4]	na	na	na	20.60	20.90	*	na	na	na	1.1	1.1	*
New York	19.90	17.00	17.60	14.70	14.50	14.50	4.2	2.2	2.8	2.3	2.7	2.2
New Jersey	*	27.10	*	*	*	*	*	0.5	*	*	*	*
Pennsylvania	21.80	25.40	20.70	20.70	29.80	37.00	1.5	2.0	1.1	2.1	1.9	2.3
Maryland	31.90	31.50	32.40	33.50	*	*	2.1	2.5	1.3	1.4	*	*
Lake States:												
Michigan	19.60	21.50	22.10	*	*	*	4.2	4.2	3.5	*	*	*
Wisconsin	25.60	24.90	22.50	25.50	31.40	40.00	7.6	7.2	6.6	4.3	5.8	5.8
Minnesota	18.60	19.60	22.30	16.20	16.50	16.00	6.3	5.7	7.5	5.3	5.1	4.8
Corn Belt:												
Ohio	26.50	25.60	25.50	*	*	*	4.3	3.4	3.3	*	*	*
Indiana	35.00	35.90	32.90	*	*	*	6.1	5.7	4.5	*	*	*
Illinois	34.90	31.80	34.60	31.00	27.65	29.40	5.6	5.2	5.2	5.6	4.0	4.1
Iowa	33.60	36.10	36.40	26.35	28.05	28.90	7.3	7.0	7.2	5.5	6.2	5.0
Missouri	23.70	22.60	24.70	18.50	16.40	20.00	5.4	4.7	5.1	2.6	2.7	2.8
Northern Plains:												
North Dakota	9.20	9.10	9.70	8.30	8.00	8.50	7.1	6.8	6.7	5.9	4.9	6.3
South Dakota	8.20	7.80	8.90	9.70	8.50	9.10	7.4	6.3	6.8	6.0	5.5	6.5
Nebraska	11.80	11.30	11.10	10.20	9.20	10.00	7.4	6.9	5.9	6.1	5.4	5.8
Kansas	12.00	12.80	12.80	12.20	11.70	11.90	5.0	5.1	4.8	3.7	4.1	3.8
Appalachian:												
Virginia	22.60	20.20	19.40	14.80	14.00[6]	13.80	2.2	1.9	1.7	1.2	1.1[6]	0.7
West Virginia	14.70	16.70	17.60	17.00	14.00	*	1.9	1.9	3.3	3.0	2.2	*
North Carolina	21.30	23.20	23.00	16.90	17.00[6]	22.20	2.1	1.8	1.9	0.9	1.0[6]	1.1
Kentucky	25.90	24.50	26.20	*	*	*	3.3	3.3	3.3	*	*	*
Tennessee	23.50	25.80	31.90	15.20	14.30	13.50	2.9	3.3	4.4	0.8	0.7	0.8
Southeast:												
South Carolina	15.30	16.40	18.80	*	16.11	*	2.2	1.8	2.2	*	1.7	*
Georgia	19.70	21.10	23.00	20.00	19.20	23.20	2.6	2.2	2.3	1.4	1.4	1.9
Florida	21.40	21.00	17.00	17.00	19.50	17.40	0.8	0.8	1.2	.7	.8	0.6
Alabama	18.80	19.40	19.10	13.10	12.50	15.80	3.2	3.6	3.1	2.4	2.0	1.9
Delta States:												
Mississippi	14.90	15.00	14.90	15.90	13.00	15.60	3.4	3.1	2.8	2.5	2.0	2.6
Arkansas	18.60	19.90	18.00	20.90	15.60	*	4.0	4.9	3.5	2.0	1.2	*
Louisiana	17.20	14.50	15.60	13.00	12.60	12.60	2.7	2.1	2.3	0.9	0.8	0.7
Southern Plains:												
Oklahoma	10.20	9.40	9.60	9.40	9.20	8.00	3.4	3.0	3.1	3.2	3.1	3.3
Texas	6.90	7.00	7.30	5.00	4.80	5.40	1.8	1.6	1.5	1.2	1.4	1.1
Mountain:[5]												
Montana	6.60	8.10	6.20	5.50	5.10	7.20	5.5	5.8	4.7	4.7	3.9	4.3
Idaho	26.50	19.10	23.10	28.20	29.30	*	6.1	6.3	5.7	4.9	4.5	*
Wyoming	3.60	4.20	5.80	3.10	3.50	*	3.6	3.8	3.9	2.5	2.9	*
Colorado	6.80	10.90	11.50	*	*	*	3.2	5.1	5.3	*	*	*
New Mexico	na	na	na	1.60	1.80	*	na	na	na	1.5	1.5	*
Utah	25.70	23.00	20.90	16.30	13.70	*	3.5	3.2	1.9	0.9	0.7	*
Pacific:												
Washington	21.90	29.80	25.10	*	*	*	4.0	4.2	3.1	*	*	*
Oregon	22.60	25.40	21.50	*	*	*	4.0	6.0	6.8	*	*	*
California	37.90	34.20	44.90	26.90	39.30	*	2.2	1.8	1.6	1.6	2.5	*

na = data not available; * = insufficient information. [1] Cash rent as a percent of per acre value of rented pasture. [2] ALVS is Agricultural Land Values Survey. [3] JAS is June Agricultural Survey. [4] Combines 6 States. [5] Insufficient data gathered to estimate rents for Arizona and Nevada. [6] Revisions of previously published estimate.

Source: USDA, ERS, based on Agricultural Land Value Survey and June Agricultural Survey data.

Table 1.4.7—Cattle grazing rates on privately owned nonirrigated land, 1982-96

State	1982	1987	1990	1991	1992	1993	1994	1995	1996
	Dollars per animal-unit month[1]								
Northern Plains:									
North Dakota	8.34	7.41	8.52	8.93	10.04	10.00	9.75	10.30	10.60
South Dakota	11.09	8.61	12.53	12.74	12.44	12.60	13.20	13.90	13.20
Nebraska	13.80	10.29	15.78	14.83	14.83	17.00	17.50	17.60	18.00
Kansas	9.59	8.87	10.58	11.10	10.99	11.30	11.00	10.50	12.00
Southern Plains:									
Oklahoma	6.29	5.68	4.31[2]	7.23	6.58[2]	7.10	6.20	7.00	7.00
Texas	8.06	8.30	7.61[2]	8.60[2]	8.92	8.75	8.75	9.10	8.00
Mountain:									
Montana	8.90	7.94	9.61	10.58	11.86	11.40	11.80	11.90	11.80
Idaho	7.98	6.60	8.42	10.18	9.49	9.25	9.70	10.10	10.20
Wyoming	8.46	6.31	9.64	9.98	9.93	10.50	10.50	11.30	11.00
Colorado	9.04	8.27	10.20	9.30	10.11	9.70	10.20	10.30	11.40
New Mexico	6.26	5.82	6.66	3.02[2]	6.95	7.55	8.08	8.74	8.87
Arizona	*	7.19	*	*	5.53	5.72	5.72	5.75	6.50
Utah	9.29	5.98	7.79	9.64	9.79	8.90	9.00	9.50	9.75
Nevada	5.70	7.31	*	9.45	10.26	8.80	8.80	8.80	8.80
Pacific:									
Washington	6.67	9.55	7.82	7.81	10.69	7.80	8.30	8.50	8.70
Oregon	7.70	5.91	8.28	8.93	9.28	9.75	9.00	10.20	10.00
California	9.23	8.46	9.81[2]	9.61	10.09	10.40	11.00	10.50	10.10
16-State average[3]	9.75	8.09	10.86	9.78	10.46	10.60	11.30	11.20	11.40

[1] Includes cow-calf rates converted to animal-unit month rates.
[2] Coefficient of variation exceeds 15 percent.
[3] All States except Texas.
* Insufficient number of reports for an accurate estimate of grazing rates.
Source: USDA, ERS, based on USDA, 1993b; and on USDA, NASS, *Agricultural Prices*.

formula, grazing fees on public land were lowered 16 percent in January 1996, reflecting lower market prices for livestock and increased production costs. The new fees, which took effect March 1, were set at $1.35 per AUM, 26 cents less than in 1995. (For more on grazing issues, see chapter 1.1, *Land Use*.)

Agricultural Real Estate Taxes

USDA's agricultural real estate tax estimates are used as components in its prices-paid indexes for commodities and services, interest, taxes, and farm wages. Property taxes on farm real estate are a direct cost to landowners, but when farmland is cash-rented, those taxes are passed on to tenants through rents paid, and thus agricultural real estate taxes become a significant cost of production faced by all farm operators. Agricultural real estate taxes are a principal source of funding for State and local governments.

Taxes levied on U.S. agricultural real estate (land and buildings) by State and local governments totaled $4.9 billion in 1994 (the most recent year for which data are available), 2 percent less than a year earlier (table 1.4.8). The U.S. average tax per acre was $5.86, down from $5.98 in 1993. The average tax per $100 of full market value on U.S. agricultural real estate declined from $0.85 in 1993 to $0.75 in 1994 (fig. 1.4.4, table 1.4.8). Agricultural real estate taxes include all ad-valorem taxes (meaning based on value) after allowing for preferential assessments and any old age, homestead, or veterans' exemptions (excluded are levies based on benefits received, such as irrigation and drainage improvements).

Compared with 1993, taxes per acre in 1994 averaged higher in 33 States, lower in 10, and unchanged in 6. Taxes per $100 of full market value in 1994 were higher in 4 States, lower in 39, and unchanged in 6. Taxes varied widely among the States, ranging in 1994 from 40 cents per acre in New Mexico to $56.75 in Rhode Island. Taxes per $100 of full market value ranged from 8 cents in Delaware to $2.00 in Wisconsin. Total and per-acre taxes levied in Michigan declined by 51 percent, reflecting an extensive restructuring of that State's tax system. If, instead, Michigan agricultural real estate taxes had not changed (i.e., zero percent change), then U.S. total and per-acre taxes levied would have shown increases rather than decreases.

Table 1.4.8—Taxes levied on agricultural real estate, by State, 1992-94

State	Total taxes			Average tax per acre			Taxes per $100 of full market value		
	1992	1993	1994	1992	1993	1994	1992	1993	1994
	Million dollars			*Dollars*			*Dollars*		
Alabama	10.9	11.1	11.4	1.32	1.32	1.32	0.16	0.15	0.14
Arizona	49.2	50.7	50.5	5.85	6.02	6.02	1.94	1.97	1.92
Arkansas	38.0	38.6	38.5	2.76	2.83	2.86	0.38	0.37	0.36
California	314.1	338.7	344.4	12.87	13.93	14.21	0.73	0.81	0.83
Colorado	81.2	83.2	89.5	2.83	2.90	3.13	0.77	0.76	0.73
Connecticut	10.0	9.9	9.9	27.46	27.85	28.69	0.68	0.65	0.61
Delaware	1.2	1.2	1.2	2.17	2.24	2.17	0.10	0.09	0.08
Florida	143.8	140.7	130.8	14.75	14.71	13.68	0.72	0.71	0.62
Georgia	53.4	52.4	53.5	5.39	5.29	5.40	0.60	0.55	0.55
Hawaii	42.3	42.9	41.6	24.92	25.33	24.59	0.69	0.74	0.75
Idaho	40.4	39.8	39.7	3.64	3.58	3.58	0.53	0.52	0.46
Illinois	428.6	431.2	465.7	15.18	15.32	16.55	1.01	1.02	1.01
Indiana	131.0	138.6	142.8	8.23	8.71	8.97	0.63	0.64	0.61
Iowa	350.2	358.9	350.6	11.13	11.44	11.21	0.95	0.92	0.85
Kansas	102.7	107.1	111.5	2.22	2.32	2.41	0.46	0.47	0.45
Kentucky	41.6	43.6	44.0	3.04	3.19	3.22	0.31	0.29	0.28
Louisiana	19.4	18.2	17.8	2.61	2.48	2.48	0.29	0.26	0.26
Maine	13.5	13.7	13.9	10.37	10.77	11.31	1.11	1.09	1.05
Maryland	22.7	23.8	24.7	10.64	11.14	11.59	0.47	0.44	0.40
Massachusetts	15.3	14.7	14.9	26.31	26.87	27.68	0.77	0.73	0.69
Michigan[1]	359.5	359.4	176.1	35.65	35.97	17.63	3.23	3.18	1.45
Minnesota	196.1	198.2	206.2	7.45	7.56	7.86	0.85	0.84	0.87
Mississippi	22.7	22.3	22.5	2.33	2.29	2.31	0.32	0.30	0.28
Missouri	75.9	78.4	79.7	2.63	2.73	2.78	0.38	0.38	0.37
Montana	80.5	86.1	71.4	1.66	1.78	1.48	0.66	0.66	0.49
Nebraska	352.8	398.0	426.0	8.06	9.10	9.74	1.42	1.57	1.53
Nevada	4.1	4.1	4.1	0.78	0.76	0.78	0.34	0.36	0.34
New Hampshire	8.3	9.2	9.6	21.18	23.80	24.99	1.04	1.09	1.05
New Jersey	35.0	36.0	36.6	40.83	42.40	43.67	0.86	0.93	0.90
New Mexico	12.5	12.5	12.2	0.41	0.41	0.40	0.17	0.18	0.17
New York	165.4	160.3	156.3	20.98	20.33	20.33	2.00	1.82	1.63
North Carolina	58.5	59.8	60.3	6.90	7.12	7.26	0.55	0.54	0.54
North Dakota	87.0	90.2	92.1	2.33	2.42	2.47	0.65	0.62	0.60
Ohio	155.9	167.0	175.4	10.52	11.42	11.99	0.84	0.90	0.87
Oklahoma	63.6	64.6	65.1	2.04	2.07	2.09	0.41	0.41	0.39
Oregon	86.2	77.8	70.7	5.45	4.91	4.47	0.90	0.75	0.60
Pennsylvania	131.8	132.8	133.7	17.79	18.13	18.49	0.98	1.04	0.97
Rhode Island	2.9	3.0	2.9	54.38	58.51	56.75	1.18	1.20	1.06
South Carolina	19.5	19.8	20.2	4.23	4.33	4.42	0.45	0.50	0.48
South Dakota	133.4	152.0	139.9	3.61	4.11	3.78	0.99	1.11	0.98
Tennessee	52.3	53.2	52.7	4.50	4.65	4.65	0.46	0.44	0.44
Texas	367.5	379.3	391.4	2.93	3.02	3.14	0.63	0.64	0.64
Utah	11.7	12.1	12.6	1.66	1.74	1.83	0.39	0.38	0.36
Vermont	20.8	21.3	21.9	14.98	15.77	16.56	1.38	1.36	1.31
Virginia	59.0	61.7	63.5	7.15	7.57	7.80	0.52	0.58	0.58
Washington	72.3	74.2	77.0	5.63	5.78	6.07	0.71	0.74	0.68
West Virginia	4.6	4.5	5.0	1.37	1.34	1.49	0.19	0.19	0.21
Wisconsin	302.2	308.2	307.6	18.68	19.27	19.46	2.15	2.07	2.00
Wyoming	17.5	18.5	18.6	0.74	0.78	0.79	0.54	0.52	0.47
United States[2]	4,869.2	5,023.3	4,908.6	5.78	5.98	5.86	0.84	0.85	0.75

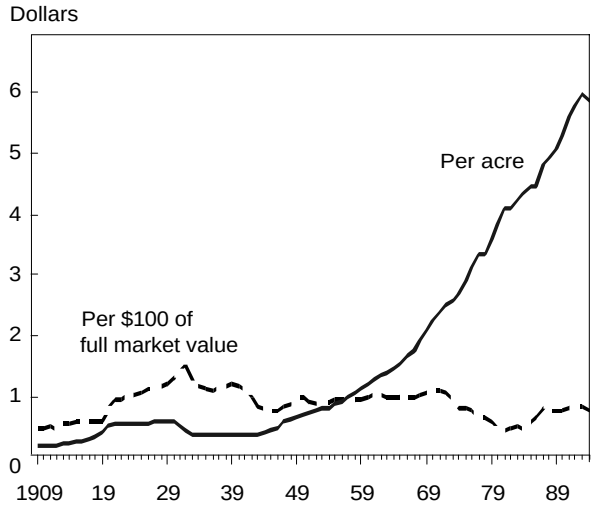
[1] Change between 1993-94 reflects extensive restructuring of Michigan tax system.

[2] Excludes Alaska.

Source: USDA, ERS, based on Agricultural Real Estate Tax Survey data.

State variation in agricultural real estate tax rates is partly due to (1) the degree to which States rely on real estate taxes as a source of local revenue; (2) the extent to which States provide tax relief, such as use-value assessment, homestead and old-age exemptions, and veterans' preferences; and (3) taxpayer resistance to increasing real estate taxes. All States have laws on preferential (or deferred) land-use assessment of farmland (Aiken, 1990). These laws provide that farmland devoted to farming be assessed on the basis of its use as farmland and not according to its market value. For example, farm or ranch land in a developing urban area would be taxed as farm or ranch land and not at the market value for which the land might sell for, say, residential development. These laws are designed not only to reduce agricultural real estate taxes, but also to encourage the protection of farms and ranches for such aesthetic reasons as open space. Laws vary from State to State with respect to minimum acreage requirements, minimum number of years in farming, percentage of gross annual income the landowner receives from the land, and penalties for converting the land to a nonfarm use.

Figure 1.4.4--U.S. agricultural real estate taxes



Source: USDA, ERS, Agricultural Real Estate Tax Survey data.

Factors Affecting Farm Real Estate Values

Farm real estate values are affected by many factors, both agricultural and nonagricultural. The net returns from agricultural use of farmland, for which cash rents are often used as a measure, are a principal determinant of farmland values. Farmland values are also influenced by capital investment in farm structures, nonfarm demand for farmland, interest rates, government commodity programs, and a myriad of lesser factors.

Building value currently accounts for about 22 percent of total U.S. farm real estate value, but the percentage varies across the United States. For instance, in Wisconsin, with substantial investment in capital-intensive dairy facilities, buildings account for 42 percent of farm real estate value. In arid regions of the West, buildings account for much less: in Arizona, for instance, building value is 10 percent of total real estate value. Building value as a percentage of farm real estate value also varies across time. Canning (1992) showed farm structures constituting as much as 31 percent (1940) of total U.S. farm real estate value and as little as 14 percent (1979). The interaction of inflation and income tax rates appears to be an important determinant of this relationship.

The potential to convert farmland to nonagricultural uses can increase the price of farmland well above its value in agricultural use. In heavily populated areas, especially, competing demands from nonagricultural uses can far outweigh agricultural productivity as a determinant of farmland value (Robison and Koenig, 1992). Some indication of the influence of urbanization can be gained by examining the rent-to-value ratios in table 1.4.5. In densely populated States along the East Coast, rent-to-value ratios are relatively low, indicating that cash rents (a measure of agricultural productivity) account for only a small proportion of the market value of farm real estate. In more rural States—the Plains, for example—cash rents account for much larger percentages of market value.

Interest rates, particularly real or inflation-adjusted rates, have been identified as particularly important determinants of U.S. farmland values during the post 1960's period (Gertel, 1990). During much of the mid- to late 1970's, real (inflation-adjusted) interest rates were actually negative, implying a strong incentive to borrow money, with much of the borrowed money used to purchase farmland. Conversely, real interest rates dramatically increased from 1981 to 1985 when nominal interest rates increased rapidly just as expectations of future inflation were decreasing. The resulting increase in the real mortgage interest rate has been attributed as a cause of the slide in farmland values in the early and mid-1980's (Gertel, 1988).

An array of government policies influence the income derived from farmland, and hence its value. Government commodity support programs are the most obvious, but also important are farm credit

programs, zoning regulations, habitat protection laws, infrastructure development (such as roads and dams), environmental regulations, and even property and income tax policy. Research has shown that commodity programs have increased farmland values relative to what they would have been in the absence of such programs (Featherstone and Baker, 1988; Herriges, Barickman, and Shogren, 1992). As government assumes a smaller role in the farm economy, analysts expect commodity support programs to be less important in the determination of farmland values. (See chapters 1.1, *Land Use*, and 1.2, *Land Tenure*, for discussion of land use and property rights issues affecting land values.)

The 1996 Farm Act, which phases out commodity support payments over 7 years, has raised concern that such changes will lower farmland values and, hence, the net worth and creditworthiness of farm businesses. Farm-dependent rural communities are concerned that reductions in government commodity support programs will adversely affect the finances of local governments, whose operating revenues are largely dependent on the *ad valorem* property tax. Reductions in farm returns, including government payments, could also have the secondary effect of reducing the incomes of some rural, nonfarm businesses.

Studies conducted by ERS concluded that farmland values could decline by as much as 15 percent if commodity programs abruptly ended (Shoemaker, Perry, and Beach, 1995). Because producers likely have been expecting some reduction in support programs for several years, farmland values in areas heavily dependent on program payments may have already adjusted, as farmers incorporated expectations of changing commodity programs and lower support payments into their assessment of future net returns. With time, producers can adjust capital and other inputs and make other changes to production practices that may mitigate any reduction in program payments. Given that the reduction is being phased in slowly, any remaining impact on farmland values should be small and the effect will probably be overshadowed by recent increases in grain prices.

A myriad of lesser factors contribute to spatial variation in farmland values, including site-specific characteristics of individual parcels. Among these are access to major highways and proximity to commodity and input markets. Nonfarm, but income-generating, uses of farmland are possible on some parcels, including fee-recreation and fee-hunting. Also, farmland value may be enhanced by the attraction of farming as a lifestyle (farm occupation), an aesthetic location, or homesite potential. Inflation, interest rates, lending policies of farm credit agencies and banks, and speculation have also been identified as factors external to farmland markets that affect farmland values.

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Surveys for Collecting Data on Agricultural Land Values, Rents, and Taxes

In 1994, questions on land values and cash rents were added to the June Agricultural Survey (JAS) to replace the Agricultural Land Values Survey (ALVS) which had been used since 1984. The ALVS, as well as the Farmland Market Survey, were discontinued after 1994 in order to reduce respondent burden and data collection costs. The JAS, conducted by the National Agricultural Statistics Service (NASS), is a probability-based survey that divides the area of the United States into "segments" representative of national land uses. A representative sample of all land uses in the 48 contiguous States is obtained by selecting approximately 1 percent of all land in these States for inclusion in the JAS. Twenty percent of the segments are replaced each year. Within the selected segments, enumerators identify "tracts," which represent a particular farm operator's acreage within the segment. Farm operators then provide per acre estimates of value and cash rents for the farmland in their tract. In 1995, 14,603 segments were sampled. Within these segments, enumerators identified 119,012 tracts, of which 50,294 were classified as agricultural. Cash rental acres were identified in 17,565 tracts (35 percent of total agricultural tracts).

The JAS—with its area-frame design, probability basis, and personal interview format—is expected to more accurately portray average conditions in each State's farmland market than did the ALVS. There are several advantages to using JAS. First, JAS uses a much larger sample: approximately 50,000 observations, or about three times as many as the ALVS. Second, the random selection of area-based segments, with 80 percent resurveyed each year, is expected to enhance the statistical reliability of USDA estimates of both farmland values and cash rents. Third, respondents estimate the value or report the cash rent for land they operate within a specific land segment (usually about 1 square mile in area). Respondents to the ALVS, on the other hand, reported values and cash rents for a nonspecific "locality." And finally, most responses to the ALVS were obtained through telephone contacts, while JAS respondents are visited.

The 1-year overlap of the two surveys in 1994 allows a comparison of cash rent estimates. For most States, the two estimates are similar; for a few States, noticeable differences exist. Several factors associated with the change of survey instrument may have contributed to the differences, but these can be bridged by comparing the cash rent indicators from successive years on each survey.

Data on agricultural real estate taxes are obtained from a national survey of approximately 4,200 taxing jurisdictions. Each provides tax and acreage information for a sample of 10 farm or ranch parcels in its jurisdiction for the current and preceding years. Respondents in jurisdictions with fewer than 10 parcels are requested to provide information on all parcels in the jurisdiction. Taxes per $100 of market value are derived by dividing the average per-acre tax by the average per-acre value of farm real estate. This data series, by State and Nation, dates from 1890 for taxes per acre and from 1909 for total taxes and taxes per $100 of full market value.

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Recent ERS Reports on Land Values, Rents, and Taxes

Agricultural Income and Finance, Situation and Outlook (Annual Lender Issue), AIS-64, Feb. 1997 (Jerome Stam, ed.). This report discusses the financial conditions of commercial agricultural lenders during 1996. Focuses on the four major institutional farm lenders: commercial banks, the Farm Credit System, the Farm Services Agency, and life insurance companies. Financial institutions serving agriculture continued to experience improved conditions in 1996. In recent years, farm-debt-to-farm-income ratios have dropped and farm real estate value increases have led to significantly improved equity positions for many farmers.

"Farm Real Estate Values Continue To Increase," *Agricultural Outlook*, Dec. 1996 (David Westenbarger and Charles Barnard). Discusses changes in farmland values during 1995. U.S. farm real estate values as of January 1, 1996 averaged $890 per acre—a record high—marking the 9th consecutive annual increase since 1987.

Agricultural Land Values, AREI Update, Dec. 1996, No. 15. (John Jones and David Westenbarger) This update reports ERS's annual estimates of farm real estate value for each of 48 States. U.S. farm real estate values averaged $890 per acre as of January 1, 1996—7.0 percent above a year earlier.

Agricultural Cash Rents, AREI Update, June 1997, No. 2 (David Westenbarger, John Jones, and Charles Barnard). This update reports ERS's annual estimates of cash rents for selected States, 1991-95. Cash rents as percentages of market value are also presented. For selected States, estimates are provided for cropland, irrigated cropland, nonirrigated cropland, and pasture. Cash rents for cropland were generally higher in 1995 than in 1994, while those for pasture were generally lower.

"Commodity Payments and Farmland Values," *Agricultural Outlook*, June 1995 (Robin Shoemaker, Janet Perry, and Doug Beach). Includes a general discussion of the influences that agricultural commodity program payments exert upon farmland market values. Describes possible effects that the 1995 Farm Program legislation might have on farmland values.

"New Method For Estimating Land Values," *Agricultural Outlook*, April 1995 (Dave Westenbarger, Doug Beach, and Chris Cadwallader). Discusses advantages to be gained from use of NASS's June Agricultural Survey (JAS) as the survey instrument for obtaining information on farmland values and cash rents. Also describes the statistical basis of JAS sample as it relates to collecting farmland value information.

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